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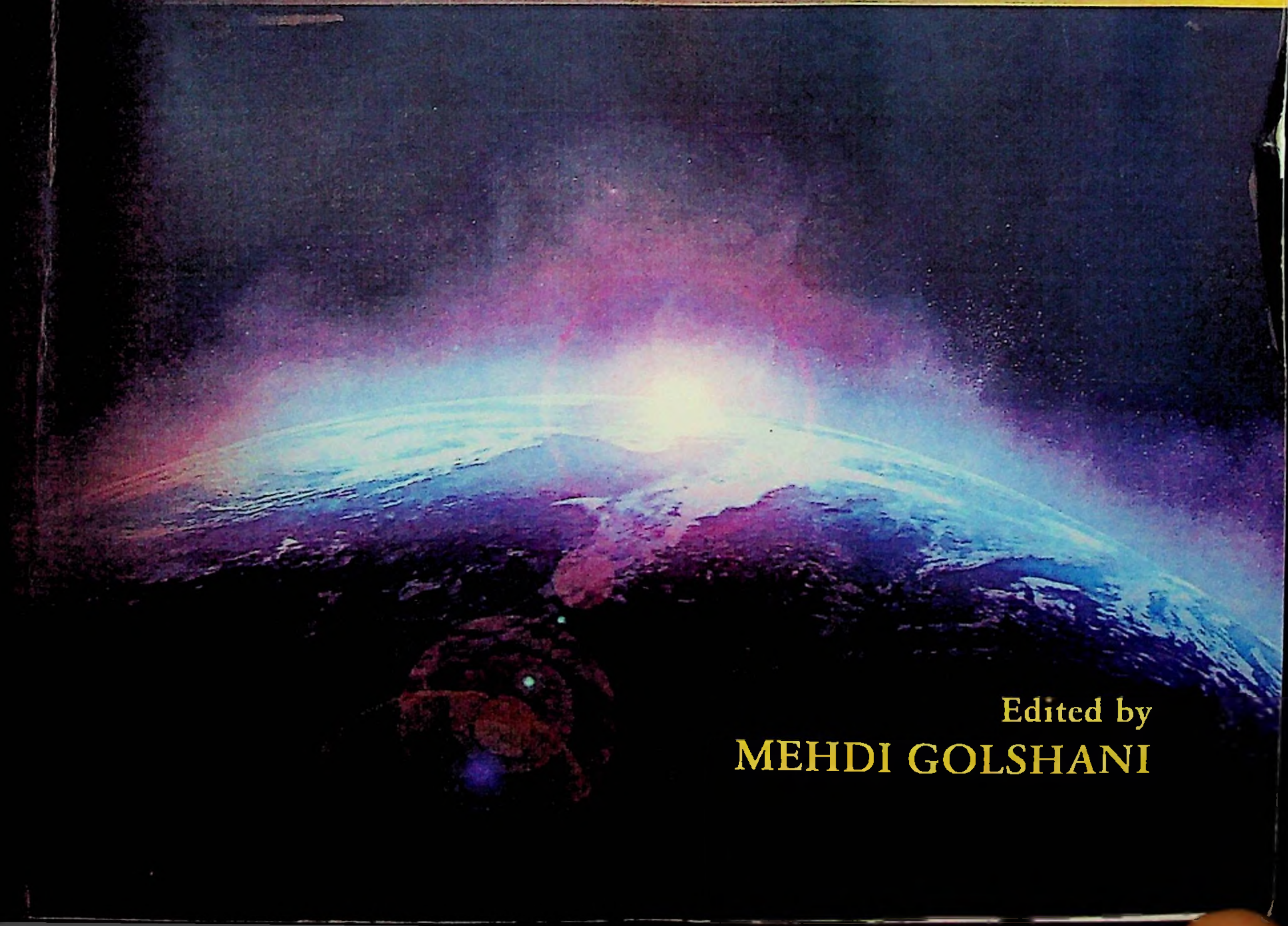
CAN SCIENCE DISPENSE WITH RELIGION ?



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Gunter Schüts in
EVANGELIUM UND WISSENSCHAFT
(No. 43, November 2003)

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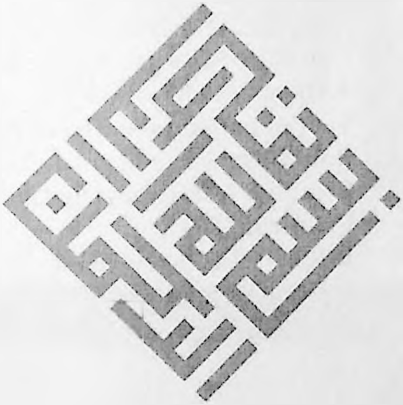

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Can Science Dispense With Religion?

Mehdi Golshani

Al-mustafa International
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&
Cultural Studies

Publisher's Forword

To begin and execute a research is like walking in the path of development and evolvement. When the seeds of the "questions" are planted, in the soil of the mind of the researcher, this phase initiates, and its end is culminated when the result and the outcome of knowledge and wisdom is gained.

Evidently, this end is a new chapter in itself, for growth, and announces beforehand this good news to humans. For the result of all those mental efforts will not only bring the blooming and flowering of talent and all kinds of Blessings to humans, but it also makes the mind of the researcher to ponder and shape new, more questions.

This will produce a great collection of growing plants and flowers for the seeking mind... Those "questions" are in fact, the seeds, which according to the necessities of Time and the strength of the researchers will grow and bloom by themselves. They will make Culture and Civilization to move forward.

In like manner, the increasing rate of transferring oneself from one place to another place and the decrease of the distances will make those seeds travel miles and miles, to faraway places, in order to install them inside the curious mind of other seekers. This will bring an amazing diversity and a novelty for another civilization...

It is true then, that the presence of knowledge and a good, capable management will help this project to develop itself and one has to admit indeed, that it has always played an important role...

Al-Mustafa International Publication and Translation Center, because of its global mission, and its special position among the Religious Schools and the colorful human diversity that it has developed inside itself, sees it as a moral duty to procure all the appropriate conditions for any research works, and takes its role in this matter, most seriously. To procure all kinds of necessary grounds, with an excellent management of all the existing possibilities and talents, and to care and protect all its researchers in religious fields; these are the most crucial responsibilities of the Department of Research in this International center.

We dearly hope that by being attentive to all these autonomous scientific movements, and by fortifying all the existing motives, we shall be able to witness the blooming of the Religious Culture in every part of this wide world!

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PREFACE

This book attempts to clarify various aspects of the relation between science and religion. The scholars who contributed to this anthology are all theists who believe that both science and religion are important aspects of our lives and neither one should be sacrificed for the sake of the other, and that there is no conflict between them if they are properly understood and if the domain of each one is correctly recognized and preserved.

We sent the following eight questions to many scientists, philosophers and theologians:

1. *What is your definition of science and of religion?*
2. *Do you see any conflict between your definitions of these two concepts?*
3. *Where do you think there may be a conflict between these two?*
4. *What have been the grounds for the development of conflict between these two?*
5. *What has been the role of religion in the development of science in the West?*
6. *Can we have a religious science?*
7. *Can science dispense with religion?*
8. *Can one separate the domains of activity of science and religion completely?*

In the first edition of the book, thirty scholars answered the questions directly. Dr. P.E. Hodgson and the late Professor K.V. Laurikainen responded by sending full length essays. In the second edition, twelve new contributions and an "Afterword" by me, analyzing the responses to the posed questions, were added. This new edition contains 81 contributions and my "Afterword" is revised.

Twenty seven of the scholars interviewed for this anthology are Muslims, the rest (fifty four) are Christians (Catholic, Protestant or Orthodox).

I hope that this anthology will contribute to the illumination of the relation between science and religion, and that it will encourage further dialogues on this vital issue.

Finally, I would like to offer my sincere thanks to Dr. Ali Abbasi ,President of Al-Mustafa International University, and Dr. Ghobadi,President of Institute for Himanities and Cultura studies, for accepting to publish this book by their institutions jointly.I am also thankful to my dear friend Mr. Asghar Saberi for his very good work on the design of this edition of the book, and to Hojatuleslam Mustafa Nobakht ,the head of Al-Mustafa publihcation department, for his fast action on the publication of the book..

Mehdi Golshani
Tehran, The Islamic Republic of Iran,
May 6, 2021

INTRODUCTION

> *Science and religion need each other. None of the two will be sufficiently close to its meaning without taking the other one absolutely seriously.*
>
> Carl Friedrich v. Weizsäcker[1]

In the Middle Ages teleology played an important role. The philosophy behind this was that everything has a special place in the hierarchy of the created world, because it is created by a God who has a designed telos to the universe.

It was during the same era that Aristotelian philosophy was synthesized with the Christian theology. The architect of this synthesis was Thomas Acquinas, who believed that reason and revelation cannot be in conflict. According to him, God is both the Creator and the Sustainer of the universe. God usually acts through natural means, but He occasionally manifests His power through miracles.

In the seventeenth century, modern science was developed in the hands of Descartes, Galileo, Newton,... . The main characteristics of this science was mathematical argumentation and experimental observation.

In this science, teleology was left aside and the description of phenomena became the goal. Descartes, who was a theist, tried to explain the world mechanically. In his word:

> *Give me matter and motion and I will construct the universe*[2]

---

[1] From Prof. von Weizsäcker's response to our questionaire.

[2] S. Jaki, *The Relevance of Physics* (Edinburgh: Scottish Academic Press, 1992), p. 111.

Following Descartes, Hobbes restricted the existence to the material world, and denied that any supra-material force can affect the material world. Galileo, who was a theist, considered the world to be made of particles which have two primary properties: mass and velocity. Galileo saw no conflict between his religious convictions and his scientific ideas, because God is the author of both the *book of Nature* and the *book of Scripture*. But, the holy book's role is to lead to the spiritual and moral development of humans. It does not provide us with scientific facts. In Galileo's words:

> *God has endowed us with senses, reason and intellect . . . would not require us to deny senses and reason in physical matters which are set before our eyes and minds by direct experiences or necessary demonstrations.*[1]

Newton and his followers developed the mechanical pictures of the universe. In the Newtonian view, the universe is like a complicated machine that follows exact laws. Newton, himself, considered this machine to be the creation of God, and he even considered a continuing role for God in giving equilibrium to the solar system, safeguarding it from perturbations. Lagrange and Laplace pointed out that perturbations in the solar system never exceed a certain limit and this is taken care of automatically. There is no need for God's intervention. Thus, the idea of filling gaps in the scientific knowledge, by appealing to God, fell out of favor. Furthermore, the mechanistic model of the universe strengthened the position of deists who restricted God's action in the physical world to the initial creation. This diminished God's involvement with the world so much that it led ultimately to atheism.

On the other hand, the founders of modern science considered the study of nature as a study of the signs of God in nature and they interpreted the presence of order in natural phenomena as an indication of God's supreme Knowledge and Wisdom. In Newton's words:

> *This most beautiful system of the sun, planets and comets could only proceed from the counsel and dominion of an intelligent and powerful being.*[2]

These pioneers were explicitly asserting that their main motivation for scientific endeavour was access to God's wonderful Handiwork. As Leibnitz put it:

---

1. S. Jaki, op. cit, p. 422.
2. Ibid., p. 437.

> *It is especially in sciences . . . that we see the wonders of God, His Power, Wisdom and Goodness . . . i.e. why, since my youth, I have given myself to the sciences that I loved.*[1]

But, with the passage of time, this outlook lost its appeal and the dependence on human reason became more and more dominant. This affected theology very seriously and the role of religion became limited to moral issues. Several factors were effective in the establishment of *scientism* during the eighteenth and nineteenth centuries, a doctrine which holds that science can explain everything and there is no need to bring God in:

1. The appearance of Darwinism in the mid-nineteenth century.

Darwinism confronted religion in four fronts by:

- disputing *the argument from design* (through describing the order of the biological world by Darwinian natural selection).
- disputing the real distinction of humans from other animals.
- disputing religious moral codes.
- disputing the special creation of mankind.

2. The prevalence of Empiricism.

The doctrine of empiricism claims that the senses are the only sources of knowledge. Thus, metaphysical concepts should be eliminated from any physical theory, because they are not rooted in sense experience. This doctrine is an old one, but it got prominence with the works of the British empiricists of the seventeenth and eighteenth centuries and was fortified by the positivism of August Comte and the logical positivism of the "Vienna Circle" of the 1920s and 30s. A common feature of all schools of empiricism is that they give primacy to sense experience and reject metaphysics.

It was claimed by empiricists that the methods of experimental knowledge are universal and that they should be used in all fields of knowledge, including humanities. Thus reductionism (both espistemological and ontological) became the rule of the game, and it was said that everything is to be ultimately explained by the laws of physical science and that everything is to be reduced to matter. As Condorcet put it:

---

[1] Ibid., p. 428.

> *[Human and physical events] were equally susceptible to being calculated and all that is necessary to reduce the whole of nature to laws similar to those which Newton discovered with the aid of calculus, is to have a sufficient number of observations and mathematics that is complex enough.*[1]

And in the words of Holbach:

> *It is to physics and to experience that man must have recourse in all his investigations: he must consult them in matters of religion, ethics, legislation, political government, the sciences and the arts, even in his pleasures and suffering*[5].

The doctrine of conflict between science and religion was developed by T.H. Huxley and his colleagues in the second half of the nineteenth century, and it was propagated by the works of two historians of science: J.W. Draper and A.D. White.

With the dominance of scientism in the second half of the nineteenth century, religion became more and more isolated and science became the religion of scientists and it became against fashion to speak of religious matters in the academic circles. This trend is still dominant. Thus, e.g. when the setting up of a lectureship in theology and natural sciences at the University of Cambridge in 1993 was announced, Richard Dawkins, an Oxford zoologist, wrote a letter to the editor of the *Independent*, in which he said:

> *Sir: In your dismally unctuous leading article (18 March) asking for a reconciliation between science and 'theology', your remark that 'people want to know as much as possible about their origins'. I certainly hope they do, but what on earth makes you think that 'theology' has anything useful to say on the subject? Science is responsible for the following knowledge about our origins.*[2]

and he concluded this letter with:

> *What makes you think that "theology" is a subject at all?*[3]

---

1. S. Jaki, op. cit., p. 465.
2. M. Poole, *Beliefs and Values in Science Education* (Buckingham: Open University Press, 1995), p. 35
3. Ibid., p. 36.

One can safely say that the main factor in weakening religion in our century is the prevalence of philosophies that rejected metaphysics and restricted knowledge to the experimental one.

In the last few decades, however, science has lost part of its sovereignty and one notices a revival of interest in religion. Today scientists are much less arrogant and they are more cautious about the limits of science than they were, say, forty years ago. There are several reasons for this change of attitude. We just mention the most important factors:

Some scientists have disputed the claim that science could answer ultimate questions of human concern. In the words of J. Polkinghorne:

> *I believe that, in principle, scientifically passable questions are scientifically answerable. We should use our scientific knowledge and abilities to learn all we can about the probable early history of the universe and about how inanimate matter complexified into living matter. However, other questions which we surely must ask – such as, why is there a world at all? Why is it the way it is in its given law and circumstance? Is there a purpose behind cosmic history? – are not scientific and require metaphysics for their answer. I find the most satisfying and comprehensive answer to be provided by theism.*[1]

It has been noticed that contemporary science is based on some controversial generalizations. For example, our knowledge about the early universe is so little that we should be careful in answering questions concerning the origin just on the basis of some transient theories. The American astrophysicist J. Bahcal has beautifully expressed the matter:

> *I personally feel it is presumptuous to believe that man can determine the whole temporal structure of the universe, its evolution, development and ultimate fate from the first nanosecond of creation to the last 1010 years on the basis of three or four facts which are not very accurately known and are disputed among the experts. That I find, I would say, almost immodest.*[2]

and in the words of John Polkinghorne:

> *It is not obvious to me that it is feasible and sensible program to apply quantum mechanics to the whole universe. The universe is a different sort*

---

[1] H. Margenau and R.A. Varghese, eds., *Cosmos, Bios, Theos* (La Salle, Ill.: Open Court, 1992), p. 88.

[2] E. Regis, *Who Got Einstein's Office?* (London: Simon & Schuster, 1988), pp. 210-11.

> *of entity from any subsystem contained within it; and because we do not actually understand how quantum theory relates to the everyday world, it seems to me slightly over ambitious to leapfrog that and apply it to the whole universe.*[1]

Scientific speculations about domains which are out of our control or direct observation could not be used to settle basic problems of existence. One has to go beyond the domain of science to get a deeper understanding of them. As the American astrophysicist R. Jastrow put it:

> *We have no information whatsoever about what happened in the universe when it was younger than three minutes, and in particular, when it was 10-43 second old, and so on. It seems to me naïve to construct elaborate theories that propose to answer profound philosophical and religious as well as scientific questions, on the basis of speculation about an area never touched, directly or indirectly, by observation.*[2]

It has become more and more clear that science cannot work without some meta-scientific assumptions: the assumption of reliability of senses-data, the assumption of comprehensibility of nature by human intellect, etc.

Science cannot explain its own success, and it cannot rule out meta-scientific dimensions of the universe. In Michael Poole's words:

> *It is no use going to science, which is the study of nature to try to find out whether there is anything other than nature to which nature owes its existence.*[3]

Gödel's incompleteness theorem has disappointed those who thought through mathematical physics they could explain everything. Eugene Wigner, Nobel Laureate in physics (1963), elaborates on this point:

> *My best friend, John von Neumann, tried to prove the consistency of mathematics, and he was upset when Gödel proved that it cannot be proved. That was quite a shock to John von Neumann.*[4]

Some religious scholars have tried to become experts in various areas of modern science and have tried to explore the common grounds of science

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1. J. Polkinghorne, *Serious Talk* (London: SCM Press LTD, 1996), p. 31.
2. H. Margenau and R.A. Varghese., op. cit., p. 47.
3. M. Poole, op. cit., p. 38.
4. T.D. Singh and Ravi Gomatam, eds., *Synthesis of Science and Religion* (Bombay: The Bhaktivedanta Institute, 1987), p. 258.

and religion. On the other hand, some scientists have willingly exposed themselves to theological ideas, and, frequently, scientists, philosophers and theologians have become engaged in serious dialogue. Thus, they have got a better understanding of each other's position.

Science has contributed much to the progress and welfare of mankind, but this has been at the expense of human values, and has considerably nullified the achievements of science. The two world wars of the twentieth century showed that misguided science and technology could lead to destruction. Thus, it has become clear that science cannot provide a sense of direction and cannot bring peace and tranquility to human beings. The separation between science on the one hand and philosophy and religion on the other hand, has produced a gap between technical knowledge and the priorities of its applications. It is religion with its value system and intellectual and spiritual dimensions that can give proper direction to the use of technical knowledge.

In short, human experience has more dimensions than what science can accommodate. One needs a much larger framework to integrate all aspects of human experience. Dr. R.L. Thompson has put the matter nicely:

> *The understanding of nature as a machine has resulted in much technological progress, but now we find people throughout the world abandoning traditional ways of life to join in a struggle for technical supremacy - a struggle that culminates in the construction of more and more deadly machines of mass destruction.*
>
> *It can be argued that this trend of modern civilization has been strongly encouraged by scientific theories that appear to contradict any philosophy of life other than materialism. It may be very difficult to change this dangerous trend. But an essential ingredient for such a change could be the wide dissemination of a valid approach to scientific knowledge that allows for a tangible spiritual dimension to human life and is compatible with the ancient understanding that mankind is dependent on a transcendental Supreme Being. Such an approach opens up the possibility of directing human energy towards higher spiritual goals and of providing a solid ethical basis for the conduct of our material affairs.*[1]

The program of reductionism, both epistemological and ontological, has been confronted with serious obstacles. Thus, there has been serious challenges to the reduction of the whole physics to the elementary particle physics or the reduction of life to microbiology. In the words of Dr. Maurice H. Wilkins (Nobel Laureate in Medicine, 1962):

---

[1] T.D. Singh and Ravi Gomatam, op. cit., p. 235.

> *But, I don't agree with the molecular biologists who think that the whole nature of life can be comprehended in terms of molecular biology alone. I think that is a very simple minded, mechanistic way of thinking.*[1]

In the last three decades, especially during 90s, we are seeing a noticeable movement towards religion and spirituality. As a witness to this movement, we just mention a few observations:

1. Popular books of eminent scientists, which bear the name of God (e.g. *God and the New Physics, The God Particle, The Mind of God*, etc.) have sold out, and their number is increasing. The main reason for popularity of these books is that people really want to remove any discrepancy between their faith and science.

2. During the last two decades, there has been an increasing number of conferences about the subjects of mutual interest between science and religion. An important and unprecedented aspect of these conferences is that they have been interdisciplinary, i.e. they involved scientists, philosophers and theologians. Thus, they were very fruitful and enriching.

Also, there has been a very rapid increase in the number of science - religion courses offered by Western universities, and some universities have even started MA and Ph.D. programs in science and religion.

Furthermore, several important research institutes have been established, which have been instrumental in setting up major conferences and publishing journals and books.

Finally, a large number of books have come out which have dealt with the problems at the interface of science and religion, illuminating various aspects of the relation between these two fundamental departments of human concern.

About thirty years ago Ian Barbour categorized possible ways of relating science and religion. His categories were: conflict, independence, dialogue and integration. At that time one could count most of the scientists and philosophers as belonging to the first two categories. Today, an increasing number of scientists believe in dialogue or integration, and some, including myself, consider scientific endeavour as part of religious experience.

---

[1] T.D. Singh and Ravi Gomatam, op. cit., p. 33.

Furthermore, many scholars are seeking common grounds for discussion between theology and science. Thus, science-religion dialogue has become very exciting, and science-theology venture seems very promising.

To contribute to the good traffic between scientific and theological ideas, the idea of preparing this book was conceived. Believing that:

- religion can accommodate scientific insights
- religion can give sense of direction to science
- both religion and science contribute to the understanding of nature, and together they provide a deeper vision of truth,

I sent a set of eight questions to many theist scholars of various disciplines and religious faiths. The responses are reproduced in the following pages.

A proper understanding of the relation between science and religion is of at most importance for securing the spiritual welfare of all humanity. May this book contribute to a better appreciation of this relation.

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Prof. Alparsalan Acikgenc

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Postgraduate Experience: He has taught at Middle East Technical University in Ankara and at the International Institute of Islamic Thought and Civilization in Kuala Lumpur. Currently, he is professor of the History of Philosophy at Fatih University in Istanbul, Turkey.

Publications: He is the author of numerous papers on philosophy as a science of system, on transcendent rationality and on philosophy in the Qur'anic context. His published books include *Being and Existence in Sadra and Heideger. A Comparative Ontology*, (Kuala Lumpur: ISTAC, 1993); *Philosophy of Knowledge* (in Turkish, 1992); *Islamic Science: Towards a Definition* (Kuala Lumpur: ISTAC, 1996); *Scientific Thought and its Burdens: An Essay in the History and Philosophy of Science* (Istanbul, Fatih University, Pub., 2000).

1. What is your definition of science and of religion?

Science is essentially a knowledge acquisition process, and as such it should be defined from an epistemological perspective. If we examine the present conceptions of science, we find that each of them emphasizes one aspect of science. The sociological conception, for example, views science as a social phenomenon; the historicist school takes it to be primarily a process, and the positivist school pays attention only to its cognitive aspect. If we combine all these aspects, we shall find that science emerges as a result of a long process of learning. At some point of this process, members of that learning tradition become aware of the fact that a systematic arrangement of each subject which has been investigated by their predecessors, constitutes an organized body of knowledge that can be named. By this time, the discipline under scrutiny has already acquired four fundamental characteristics; having a well defined subject matter, clearly formulated methodology, a body of theories and accumulated scientific discoveries. Under these considerations, we may offer the following definition: Science is the named awareness of an organized body of knowledge, which arises as a result of the process in determining a subject matter, investigated by a certain method yielding theories. Religion, on the other hand, is the Divine Guidance for humanity. As it is clear from both definitions, science is a human venture, whereas religion is God-given. Therefore, by definition human beings do not have an authority to establish religion. In other words, humans cannot make and unmake religion. Although religion is a Divine Guidance for humanity, it is not the kind of guidance that gives us an exhaustive list of how we should behave in any given situation. If this were done by religion, we would have had to act as robots according to that list, in which case there would be no room for human intellectual creativity in any field, including sciences. Religion as a Divine Guidance bestows upon us two fundamental states of mind: one is the consciousness of the Divine Presence in all; the other is the moral sensitivity in our behaviors. Both states of mind are expressed in general principles by religion. We therefore feel the need to interpret these principles in order to apply them to certain situations in our life. This need of interpretation gradually gives rise to a systematic exposition of religion as a system of guidance. In that case, this second intellectual understanding is also defined as religion. We thus need to distinguish between these two phenomena: Religion as Divine Guidance and Religion as the interpretation of this Divine Guidance; the former is Pure Religion and the latter is the religion within a certain culture context. I believe that there is no harm in interpreting the Pure Religion in a certain cultural context. On the contrary, it is inevitable and indeed required by God; a requirement that is clear in the fact that He does not send His Guidance as a complete set of rules readily available to be applied to human life.

2.Do you see any conflict between your definitions of these two concepts?

I do not see any conflict between my definitions. In fact, these two concepts express two utterly different spheres of knowledge; and as it is clear from logic, conflict between concepts is applicable only if the two concepts in question are in the same sphere. When the spheres of knowledge are different, conflict becomes irrelevant. Science is basically a human venture, whereas religion is God-given. Therefore, the former belongs to the human sphere, but the latter to the Divine.

3.Where do you think there may be a conflict between these two?

As we have pointed out, there cannot be a conflict between the Pure Religion and science as they are of different orders. But when we attempt to interpret the God-given knowledge, i.e. the Pure Religion, in order to apply it to our life and society, then religion becomes mixed with human understanding. It is this cultural application of religion that we may find conflict between religion and science. But in this sense, religion must be distinguished from the Divinely given. In the true sense, only the Divinely given is religion, and its application is religion only in a restricted sense. Perhaps in this sense in Islam it would be called fiqh al-din as has been observed in the various schools of thought, whereas in the first sense, it is al-din, par excellence. For example, in the Qur'anic verse, this is expressed as *'innaddin 'indallah al-Islam.*

4.What have been the grounds for the development of conflict between these two?

Since the universe is created by God as a sign (*ayah*) for His Religion, this fact should not be ignored by science. For some branches of science are attempts to understand the universe, the knowledge produced as a result of this attempt will necessarily have a bearing upon our understanding of universe in relation to the fact that it is a sign of God. But if science ignores this fact, it may reach certain knowledge detrimental to the fundamental idea of religion that the universe is a Divine Sign. Moreover, as we have said, the Revealed Religion is interpreted by us in order to apply it to our life. This interpretation is not immune from errors, due to the shortcomings of human understanding. This can also be the ground for developing a conflict between science and religion. We must therefore be aware that conflict arises out of our different interpretations, not from the Religion itself.

5. What has been the role of religion in the development of science in the West?

As we have said with regard to the definition of science, there is a process as a result of which sciences emerge. This process can be named 'scientific process'. Any civilization that has meaningfully contributed to scientific progress has developed at the beginning stages of its scientific process a worldview that is suitable for cultivating some learning tradition. This learning tradition gradually develops into a scientific tradition when at its later stages it begins to give rise to specific sciences. In this sense, a scientific process is either emergent or progressive. In the former case, we observe the emergence of particular sciences, whereas in the latter we see their development into their sub-branches which become independent sciences. The earlier phases of this process, depicted here as emergent, usually shows the role of religion, if any, in the development of a scientific tradition in a civilization. When we examine the development of what has been called 'modern science' in the West (in this sense, we exclude the Greek science from Western science), we shall clearly see the role of religion in the development of science in the West. For a civilization cannot meaningfully contribute to scientific progress unless it develops a sophisticated scientific conceptual scheme for itself. This scheme is manifested simply as a conceptual framework supporting all intellectual activities at the beginning stage of the scientific process, but later becomes more sophisticated and acquires a scientific character in its later phases as sciences begin to be clearly defined and named in that tradition. Once the issue is set in this way, the influence of Christianity cannot be denied on the early development of a conceptual scheme to support the scientific and intellectual activities in the West in the Early Middle Ages. As the West developed its early conceptual scheme out of its Christian world view, a new understanding emerged therefrom; the new Aristotelian world conception was recognized as the Official Doctrine of the Church. This is then the interpretation of the religion to be applied to the newly emerging Western community. But as science came up with different results, there arose a great conflict between religion and science. It is this conflict that has continued in human history. We do not find a conflict of this kind in any other religious tradition. In a sense religion overstepped its limits and entered into the scientific zone and religious thinkers began to use science in interpreting the religious truth, whereas science falls short of understanding this truth. One shortcoming of Christianity in this conflict is its notion of Trinity and the absence of a continuous tradition of interpreting that religion manifested in its authentic Holy Book. As a result, this conflict gradually became a fundamental human problem giving the impression that religion and science are irreconcilable.

6. Can we have a religious science?

An investigation of a particular issue in a religion is what I understand to be a 'religious science'. For example, the Qur'anic exegesis is a religious science based on our definition of science. But this question has another aspect: it may inquire into another epistemological problem of questioning whether there is actually science belonging to particular religious traditions. For example, can we talk of Islamic science, Christian science, Indian science or secular science? We argue that there are indeed different traditions of science. This is because although as humans our epistemological faculties function in the same way, the way we utilize them under our cultural and psychological pressure is different. For example, as humans we all need to have food, but we all do not have the same culinary culture. In the same way, if different human societies developed sciences, there will be similar aspects as well as many different aspects. This exposition by itself is sufficient to show that there are different scientific traditions and that terms such as Islamic science, Christian science, Indian science or secular science are not myths.

7. Can science dispense with religion?

This question is the same as the question "can man dispense with religion?"; for it is a question to which the scientist himself must give an answer. It is not the science which dispenses with religion, but rather it is we who dispense with it. But figuratively we may still speak of science dispensing with religion. As we have pointed out, if the scientist is educated in a religious oriented scientific conceptual scheme, obviously he or she will not naturally dispense with religion but rather integrate his scientific activities with his religious outlook. But in this context, we may ask another question: "Is the science which has dispensed with religion beneficial for humanity?" Let me give an analogy in this case: Suppose a scientific theory is developed in such a way that it does not lead to the idea of God. Obviously a society under the influence of such a scientific tradition will gradually develop a world conception devoid of this idea. Suppose that that particular scientific theory is correct but its formulation does not support the idea of God. In this case, if one takes the idea of God for granted since the world conception of that scientific theory would be false, it will itself be false even if it expresses a scientific fact. I conclude from this that it is religion that gives meaning to our scientific activities. When I consider this conclusion, I concede that science will be harmful to humanity if it dispenses with religion.

8. Can one separate the domains of activity of science and religion completely?

This is again closely related to the above question. Separating the domains of activity of science and religion depends on the orientation and scientific training of the scientist. We may, however, as we have done above, try to objectively question the validity of such separation and its benefit for humanity. Scientists today, I think, need to question, more than in any period of history, whether science should find even the truth concerning the minute facts of reality at the cost of being destructive of humanity. It is in this respect that a scientist will find the widest horizons open for him to explore. When religion is brought into the scientific purview, it becomes its guiding principle into the depths of truth, not its obstacle to scientific truth.

Prof. John R. Albright

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Education: A.B. in Mathematics (1959), Susquehanna University, Selinsgrove, PA. M.S. in Physics (1961), University of Wisconsin, Madison, WI. Ph.D. in Physics (1964), University of Wisconsin, WI.

Post-Doctoral Professional Experience: Assistant Professor of Physics (1965-1970), Associate Professor (1970-1978), Professor (1978-1995), Associate Chair of Physics (1981-86), Professor Emeritus (since 1995), Florida State University, Tallahassee, FL; Professor of Humanities (1987-1995), Florida State University; Visiting Appointments at Argonne National Laboratory, Brookhaven National Laboratory, Fermilab, Cavendish Laboratory at Cambridge, U.K., Chicago Center for Religion and Science; Professor of Physics and Head of Chemistry & Physics (since 1995), Purdue University Calumet, Hammond, IN.

Current Areas of Research: Science & Religion; complexity and its relation to theology; determinism vs. chance; the place of teleology in science and theology.

Publications: One book and about fifty articles.

1. What is your definition of science and of religion?

Science deals with questions that are at least potentially public in nature. The questions are potentially answerable by experimentation (which is in principle repeatable by other scientists in other laboratories), by observation (as in the case of astronomy, where others may look if they have the equipment and the location), or by logical reasoning (as in theoretical science). Science implies that one should attempt to be objective and impartial. The use of science to accomplish tasks related to our lives is called technology; this use is not science, but in many people's minds it is confused with science – sometimes for better, sometimes for worse. Science does not ordinarily concern itself with such questions as ultimate causes, ultimate purposes, or values. Science asks "how?" but not "why?".

Religion can ask ultimate questions and receive answers about significance and value. Religion can and does make observation and rational inference, but is not limited to these techniques. Religion can be thoroughly private, but it need not be so; public forms of religion are well known. Individuals find religion to be of great help in centering their lives, coordinating experience of awe, and serving as comfort in difficult times. Religion is used in most societies as a sort of glue to help bond individuals to each other; as such it is useful, analogous to technology. But religious thought – or theology – does not really depend on such usage any more than science depends on technology. Religion and theology are in the habit of asking "why?".

2. Do you see any conflict between your definitions of these two concepts?

I do not see any conflict between the two concepts as I have defined them.

One way in which the two are surprisingly similar is in their use of metaphorical or analogical thinking. Religion uses mythos (narrative with ultimate meaning), and science uses models; both are trying to express dimensions of reality.

3. Where do you think there may be a conflict between these two?

Conflict between science and religion is most likely to occur when one side or the other attempts to make claims about the subject matter of the opposite side. When religion makes claims about the origins of living beings or about the nature of the shape or motion of the earth, moon, and sun, there is likely to be conflict. When scientists dismiss religion as nothing but superstition, there is likely to be conflict.

Sometimes the conflict can arise because of personal past history. A religious leader may have found studies of science and mathematics to be difficult; religious life appears to offer a safe haven from such difficulties. But when scientific ideas intrude, the religious leader may feel threatened and may lash out against "godless science". Conversely, a scientist may have experienced in childhood a repressive, anti-intellectual or superstitious form of religion. As an adult such a scientist may not have taken the time to find out that not all religions are the same, and so may lash out against them all.

Another source of conflict can arise when religious leaders confuse science with technology. A particular application of technology may in fact be morally wrong, but the leaders mistakenly preach against science.

4. What have been the grounds for the development of conflict between these two?

The basis for conflict lies in the area of metaphysics: that which is beyond science. A metaphysical statement or proposition is one that cannot be tested by the usual methods of science. Too often a scientist will say, "I do not make metaphysical statements", when in fact the statement just made is metaphysical. It is perfectly legitimate to make metaphysical statements or to assume metaphysical postulates in either science or religion; it ought to be required of thinkers that they identify such assumptions for what they are, namely metaphysical.

Both science and religion routinely make metaphysical assumptions, but these can often be in conflict. When a religious group makes the metaphysical assumption that a certain received text is infallible, there is a clear possibility that conflict with science can arise. When scientists forget that their models are only a part of reality, there is possibility for conflict.

5. What has been the role of religion in the development of science in the West?

This is a difficult question that has been debated by many scholars. The way the question is usually asked is: "why did science develop so far and so fast in Western Europe during and since the seventeenth century, in comparison with what happened in other cultures?". China, India, and the Muslim world displayed cultures that were scientifically equal to or ahead of the West until (approximately) the seventeenth century.

My opinion is that the answer to this question lies less in Christian theology than in the influence of printing and of religious strife. Gutenberg's invention of printing with moveable type was instrumental in the Protestant Reformation; on both sides of the controversy there was a phenomenal amount of publication that led to growth in literacy and to the realization of the power of information through the printed word. The growth of knowledge of all sorts, especially in science, was a consequence of these events that were unique to the West.

6. Can we have a religious science?

It is doubtful that science could or should be based on religion. It is typical of religious thought that it reveres dicta from the past; if the Bible or the Qur'an or Aristotle, or Aquinas or the Buddha said it, it must be an important truth. Sources are important, and the oldest sources are the most important.

In science it is different; if Newton or Faraday or Einstein or Fermi said it, it may or may not be true or important. Most of the big advances in science come from doubting and then refuting the received wisdom from the past. An individual scientist can and should be religious, and the scientist may thereby be helped to be a better scientist (by not giving up hope, by being upheld in times of failure, etc.); but, if science were turned into a religion, it would be too likely to ossify.

7. Can science dispense with religion?

Science could dispense with religion if religion were defined to mean superstition. It would be better to broaden the concept of religion to include the possibility of making metaphysical assumptions; in that case, religion becomes indispensable. Most of modern science is based on the completely metaphysical presupposition that nature is understandable. Another example is the idea that when two theories work equally well to describe the experimental data, the simpler one should be preferred.

8. Can one separate the domains of activity of science and religion completely?

It is possible to do so. Many – perhaps most – successful scientists act this way. Once it is recognized that even the most objective science is based on metaphysical foundations, then it becomes clearer why we have the proverbial blindness and lameness of science and religion in separation.

Prof. Denis R. Alexander

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Education: BA in Biochemistry, Oxford (1968), MA in Biochemistry, Oxford (1973), Ph.D. in Biochemistry (1971), London University.

Post-Doctoral Professional Experience: Foreign Expert, Dept. of Biochemistry, Hacettepe University, Ankara, Turkey [1972-74]; Asst. Prof., Dept. of Biological Sciences, Middle East Technical University, Ankara, Turkey [1974-80]; Assoc. Prof., National Unit of Human Genetics, Dept. of Paediatrics, American University of Beirut Medical Centre, Lebanon [1981-86]; Visiting Research Fellow in the Cell Surface Biochemistry Laboratory of the Imperial Cancer Research Fund, Lincoln's Inn Fields, London [1986-89]; Project Leader then Head of Laboratory of Lymphocyte Signalling and Development, Chairman of Programme of Molecular Immunology [1989-2005]; Senior Affiliated Scientist, Laboratory of Lymphocyte Signalling and Development, The Babraham Institute [2006-08]; Fellow of St. Edmund's College, Cambridge, 1997-present; Founding Director, The Faraday Institute for Science and Religion, St. Edmund's College, Cambridge [2006-12].

Awards and Honors: Numerous invited lectures, such as Gifford Lectures, St. Andrews University, 2012; Annual New College Lectures, University of New South Wales, Australia, 2018.

Publications: Many papers on biochemistry, neurochemistry and molecular immunology; books on science and religion, such as: *Beyond Science* [1972]; *Rebuilding the Matrix – Science and Faith in the 21st Century* [2001]; *Creation or Evolution – Do We Have to Choose?* [1st edn 2008, 2nd edn 2014]; *The Language of Genetics – an Introduction* [2011]; *Genes, Determinism and God* [2017]; *Is There Purpose in Biology?* [2018]; *Are We Slaves to our Genes?* [2020].

1. What is your definition of science and of religion?

'Science is an organised endeavour to explain the properties of the physical world by means of empirically testable theories constructed by a research community trained in specialised techniques'.

'Religion refers to an organized set of beliefs, and applications arising from those beliefs, concerning transcendental or supernatural realities, leading to communal practices.'

2. Do you see any conflict between your definitions of these two concepts?

No, I see these concepts as addressing different kinds of question concerning reality, generating complementary forms of knowledge. We can see these differences by noting some of the distinctive characteristics of modern science. For example:

1. Modern science in its methodologies excludes questions of ultimate purpose, value and significance. By contrast Aristotelian science included final causality as one of the explanatory features of nature. But empirical science only really began to make rapid progress as it became more modest in its ambitions and began to exclude the consideration of final causes.
2. Science looks for testable hypotheses
3. Science aims at formulating generalisations about the properties of things whenever possible; the highest levels of generalisation are called 'laws'.
4. Science values mathematics highly and incorporates mathematical assessment whenever appropriate and feasible.
5. Science aims at objectivity and down-plays the role of the scientific observer, deliberately excluding the personal.
6. Scientific knowledge aims to be publicly observable and repeatable; it is only taken seriously within the scientific community following publication in peer-reviewed journals. Sociologically we can define science by what is contained within the pages of scientific journals.

So the goal of the scientific community is to generate a body of reliable constructed knowledge that is deliberately restricted in its ambitions to explaining the properties of the physical world. Science achieves clarity only at the price of looking away from layers of nature available to other kinds of experience.

Religion wishes to address a different set of questions: Why is there a universe anyway? What breathes fire into the equations? (to use the language of Prof. Stephen Hawking). Does life have any purpose in an ultimate sense? Does God exist? How ought we to live in the world? The answers to these questions are not in any rivalry to scientific knowledge, but provide complementary understandings of the world and of our own responsibilities in the world.

The scientific and religious accounts of reality provide us with two complementary narratives. Both narratives are important, and are impoverished if one is considered without the other.

3. Where do you think there may be a conflict between these two?

Conflicts occur when there are 'boundary disputes' between the two domains of knowledge. If science claims that it can answer ultimate questions about reality, for example concerning the existence (or non-existence) of God, or about the ultimate purpose of life, then it is liable to come into conflict with religion. In reality science is simply unable to adjudicate between such rival metaphysical claims.

On the other hand, religious believers have sometimes made claims that rightfully belong to the domain of science; for example they have criticized the theory of evolution. But it is up to scientists to discover how God has brought biological diversity into being. It is not our position to tell God how he should have made the universe and this planet with all of its biological richness. The task of scientists is to discover how God has brought all things into being and continues to sustain them moment by moment. 'Creation' refers to everything that exists, because nothing can exist outside of God's creative will. The task of scientists is to discover how creation works.

Unfortunately some atheist scientists have exaggerated the role of science. For example, Prof. Richard Dawkins writes that "I pay religions the compliment of regarding them as scientific theories and ... I see God as a competing explanation for facts about the universe and life" (1995). So in this account science and God are seen as offering rival accounts for the reality around us. With such a view conflict between science and religion is of course the inevitable outcome. But there is no need at all to see them as rivals in the way that Prof. Dawkins suggests. It is not really a 'compliment' to religions to see them as scientific theories, as Prof. Dawkins well knows, for the simple reason that the answers to religious questions lie well beyond science, as we have already noted. Science is actually quite limited in its methods and techniques to addressing one narrow albeit very important slice of reality: the physical properties of the universe.

4. What have been the grounds for the development of conflict between these two?

The history of the development of the relationship between science and religion has been different in every country. In the middle ages and in the early modern period the term 'science' was used to refer to virtually any body of accurate constructed knowledge. Theology was famously known then as the 'queen of the sciences' because it was deemed to encompass all other forms of knowledge. In past centuries what we now know as 'science' was more commonly called 'natural philosophy' and those who pursued it were known as 'natural philosophers'. Until relatively recently in Europe there was no clear separation between the two domains in academic thinking.

To the present day the term 'science' means something different in English compared to the term used in other languages, such as French or German, or indeed Arabic or Turkish. In English the word 'science' is usually used to refer to the modern experimental scientific enterprise, as we have been using the word here. But in these other languages, whereas the term certainly includes the idea of 'modern science', it is also used with its broader sense to refer to any body of reliable constructed knowledge.

The word 'scientist' in English is of relatively recent origin and was invented in 1834 by a cleric called William Whewell who was Master of Trinity College, Cambridge University, and one of the great polymaths of 19th century Britain. Whewell also invented lots of other words in the English language, such as physicist, cathode and anode.

In Britain science and religion only gradually began to separate out as distinctive academic enterprises over a period of several centuries. The first professors of the newly founded discipline of geology at Oxford and Cambridge in early Victorian Britain were both Anglican clerics, and saw their profession as being a very suitable out-working of their theological beliefs. Science and natural theology remained close allies in Britain until well into the 19th century.

It was during the latter half of the 19th century, with the growing professionalisation of science, that most historians see the roots of the 'conflict thesis' idea of the relationship between science and religion, at least as far as Britain is concerned. In 1800 science in Britain was largely an activity run by amateurs. Financial support for science was mainly by private patronage. There were few opportunities for scientific employment. Most scientific research was carried out by gentlemen of leisure with private funding, typically clerics or those with lands, and the Royal Society provided a fashionable forum in which such gentlemen could meet in a convivial atmosphere to present their findings. Specialisation was rare, dabbling in a broad range of scientific interests still common. Patronage and employment in the sciences was much easier to find for clergy, or for laymen known for their religious commitment. The universities and secondary schools were dominated by clerics and the teaching of science was marginalised by the major emphasis placed on the humanities, particularly the classics.

By 1900 all this had changed. The scientific enterprise by then was not so dissimilar to the one that we know today. 'Scientists' had a name that everyone agreed upon, a new status as a group of professionals, and numerically were far greater than in 1800. Public spending on science had increased dramatically. Science had become more specialised, reflected in a plethora of specialist societies and journals. Clerics were less represented in the scientific world, their own calling having become increasingly professionalised during the century in response to the needs of rapidly expanding urbanised populations. Scientists were motivated less by the tenets of natural theology to pursue their professions, being more likely to practice their religious beliefs as an activity separate from their professional lives as scientists. Scientific education was now a major emphasis in both the universities and secondary schools.

It has been convincingly argued that the social changes required for such a dramatic transition of the scientific enterprise from its 1800 form to its 1900 form lie at the heart of the Victorian 'conflict thesis'. From the 1850's onwards a new group of scientists emerged who began to campaign for greater recognition of the professional rights and status of scientists. Mostly Fellows of the Royal Society, they formed an informal dining club called the X Club, and campaigned for their political goals using the Royal Society. The X Club members comprised scientists who had grown up on the peripheries of the Victorian establishment, well outside the privileged circle who had easy access to financial support for their science. Thomas Henry Huxley was a member of the X Club and particularly pugnacious in his attempts to wrest the financial and intellectual prestige then enjoyed by the Church into the hands of the newly emerging scientific community. No longer could they allow science to be controlled, as in the past, by the 'amateurish' clerics.

The conflict thesis was thus born not out of a clash between science and religion, but out of an ideological campaign to establish scientists as the leading intellectual voice in society with established prestige as an independent professional community.

The growth of the conflict model was greatly helped by a series of books that popularised warfare imagery in order to describe the relationship between science and religion. The titles speak for themselves: 'History of the Conflict between Religion and Science' by J.W.Draper (London,1875); 'A History of the Warfare of Science with Theology in Christendom' by A.D.White (London,1896); 'Landmarks in the Struggle Between Science and Religion' by J.Y.Simpson, (London,1925). These books achieved immense sales and helped in shaping the views of several generations concerning the relationship between science and religion. They stand as classic examples of tales of triumphant Scientists winning great victories over the Enemies of Science - the retrograde clerics who were keeping the people in ignorance and darkness. No modern historian of science now accepts the 'warfare' metaphor proposed by these titles as an adequate description of the historical relationship between science and faith. Furthermore, the many historical inaccuracies and distortions in these volumes have been thoroughly catalogued, mutants that still crop up in otherwise quite respectable historical literature. But they did have the effect of influencing generations of readers that there was some kind of historical conflict between science and religion.

The 'conflict model' has long been discarded by academic historians as an overarching model to describe the historical relationship between science and religion in the English speaking world. This is why a historian of science such as Stephen Shapin can remark in his book 'The Scientific Revolution', published in 1996:

"In the late Victorian period it was common to write about 'the warfare between science and religion' and to presume that these two bodies of culture must always have been in conflict. However, it has been a very long time since these attitudes have been held by historians of science".

And those same revisionist historians have also done us a great service in highlighting some of the incredible 'mutants' that have become endemic in the scientific literature, those errors of fact that, like genetic mutations, have a particular history, but which unfortunately spread with remarkable ease through the historical literature, sometimes being promoted because they suit the polemical goals of the writer.

But even though today the idea of conflict between science and religion is no longer seen as a useful or appropriate way of describing the relationship in academic circles, the 'conflict model' is still very much alive in popular culture for the reasons described above.

5. What has been the role of religion in the development of science in the West?

Many books have been written in answer to this question, so the answer here represents a very brief abstract, over-simplified due to brevity.

By general consent the 16th and 17th centuries in Europe were particularly critical for the emergence of modern science in the West. The term 'scientific revolution' has often been used to describe what happened during the course of those two centuries, although many historians of science do not like that term, preferring rather to emphasise the development of thought that was already taking place in the preceding centuries. Be that as it may, everyone is agreed that some huge changes in thinking about the physical world occurred during this period that laid the groundwork for what we now call modern science. What happened?

First we need to make an important sociological point, a point recently quantified in a rather striking fashion by the sociologist Rodney Stark. Stark decided to make a list of the most famous natural philosophers during the period 1543-1680, the critical period during which the first scientific societies and journals were established. Stark accepted into his list of 52 names only those who were themselves active natural philosophers who had made really significant contributions.

Stark found that 26 were Catholic and 26 Protestant, 15 of them having ecclesiastical careers as priests, ministers or monks. Stark divided his sample into three broad categories: the devout; the conventionally religious and the sceptics. To code someone as 'devout' Stark searched for clear signs of especially deep religious concerns. The label of 'conventionally religious' was applied to those whose biography offers no evidence of scepticism, but who were not particularly pious. The term 'sceptic' was reserved by Stark for anyone who displayed doubt that the world was the work of a conscious, responsive God. The findings are quite striking. More than 60% of the sample of star natural philosophers over this period are classified as 'devout' whereas only 2/52 (3.8%) could be classified as sceptic, and these are Edmund Halley and Paracelsus. In fact Paracelsus had many religious beliefs connected with astrology and magic, whereas it does seem that Halley was an atheist.

There are good reasons for thinking that the Christian commitment and world-view of these early natural philosophers did contribute very significantly to the emergence of modern science. But to see how this happened we need to step back to the late 11th Century when a Benedictine monk called Constantine made his way to the monastery of Monte Cassino in southern Italy. There he began to translate medical works from Arabic to Latin, the language of European academia – these included the works of Galen and Hippocrates, so supplying the foundations of medical literature on which the West would build for several centuries.

These early translations whetted the European appetite for more. Beginning in the first half of the 12th century, translation of ancient classical works into Latin, first from Arabic, later from the original Greek, became a major scholarly activity, with Spain as the main geographical focus. By the 13th century a flood of works by Aristotle were translated, and the European academic world reeled before this onslaught of new knowledge. A 14th century natural philosopher had a better library of Greek classics at his fingertips than did Augustine writing back in the early 5th century.

Many attempts were made to fuse the ancient learning with Christian theology, and the person who perhaps did more than any other to combine Aristotle with Christian teaching was the Italian Dominican friar, St. Thomas Aquinas (c. 1224-74), whose absorption of Aristotle into mediaeval theology formed a system which came to be known as 'scholasticism' by later philosophers. In the process Aquinas christianised Aristotle to a large degree. For example, Aristotle believed that matter was eternal and he had no belief in a God resembling the personal creator God of Christian theology, but Aquinas firmly maintained these key Christian doctrines. On the other hand, through Aquinas and others Aristotle's cosmology was accepted into medieval Christendom virtually as an article of faith. In Aristotle's cosmology the stationary earth is at the centre, with above a heavenly order consisting firstly of water, air and fire, then further out the heavenly bodies arranged in a series of (invisible) concentric spheres. The boundary of the universe was formed by the outermost sphere, whose divine harmony caused the circular revolution of the whole celestial system. Beyond the edge of the universe was Aristotle's god, the Unmoved Mover who, like a giant flicking an onion, kept the whole complex series of spheres moving rather ponderously around the immovable earth.

The torrent of ancient classical learning that hit Europe during the 12th and 13th centuries had an enormous impact. The role of the universities which began to be founded from the 12th century onwards was largely to convey this wealth of classical learning to their students. From the point of view of the development of science, the rediscovery of the ancient philosophers in a European context made two particularly important contributions:

First, one great ability bequeathed by the Greeks was the habit of thinking in a logical and orderly manner. Greek science was certainly not modern science, but it presented to the European mind an impressive example of what a body of constructed knowledge should look like.

Second, the passion for mathematics that is most prominent in Pythagoras and Plato had a big impact on the emergence of modern science. For the Lutheran astronomer Johannes Kepler, one of the key founders of modern astronomy, astronomers are 'the priests of God, called to interpret the Book of Nature', and the key to that interpretation is mathematics:

'Why waste words? Geometry existed before the Creation, is co-eternal with the mind of God...geometry provided God with a model for the Creation...'

Kepler was one of many early natural philosophers who along with his strongly Biblical faith drew enormous inspiration from the mathematical vision of Greek thinkers such as Pythagoras.

So to a large degree it was as Europeans reacted to this great mass of ancient classical learning that they eventually worked out a very different way of viewing the world. Apart from their common Christian commitment, perhaps what unites Stark's 50/52 star natural philosophers of the scientific revolution more than anything else is their sense that they were engaging in something quite new - their 'new natural philosophy' was distinct from that inherited from the ancients such as Aristotle.

There is no doubt that the Christian theological convictions of these early natural philosophers played a significant role in this process, and indeed many of them emphasized this point in their own writings. Four examples will illustrate the ways in which theological ideas helped to construct the tools and ways of thinking that we use in science right up to the present day.

First, central to the Abrahamic faiths is of course the concept of a Creator God who has brought into being a rational universe which can be described by physical laws. There was nothing like this all-powerful creator God in classical Greek thinking. In Plato (in his 'Timaeus') there is the idea of a demiurge struggling to shape the material of the world, already created, according to the Eternal Forms (or Ideas), but not being very successful. In Aristotle all forms of matter were characterised by their own particular and necessary characteristic or 'physis'. So the physis of a stone was to fall downwards, and the physis of fire was to rise upwards. But Aristotle's Unmoved Mover is nothing like the Creator God of the Abrahamic faiths, and according to Aristotle matter is eternal – there is no need for a creator anyway.

So the notion of the 'laws of science', which we now take so much for granted, is actually quite a recent concept, and was nurtured particularly out of the theistic convictions of Newton, Robert Boyle and Rene Descartes. The idea was that just as there is a creator God who establishes moral laws for the universe, so there must be scientific laws that describe God's rational mathematical activity in His creation. As Descartes wrote to Mersenne, on April 15, 1630: "God established these laws in nature, in the same way as a king establishes laws in his kingdom." What is more, God put them in our souls, "as a king would inscribe his laws on the hearts of all his subjects, if he were able to do it".

A second theme that we find in the writings of the early natural philosophers is the idea that the contingency of God's actions encourages an empirical attitude towards the natural world. The God of the Bible can do what he likes, and it is up to natural philosophers to determine this empirically, it cannot be worked out from first principles as the Greek rationalists mistakenly thought. This point was made explicitly by Cotes in his preface to the second edition of Isaac Newton's great work the 'Principia Mathematica' in words clearly approved by Newton himself:

'Without all doubt this world...could arise from nothing but the perfectly free will of God....These (laws of nature) therefore we must not seek from uncertain conjectures, but learn them from observations and experiments.

Newton himself was a devout believer who wrote far more on Biblical themes than he ever did on physics (in fact more than a million words on such topics, with another million words on alchemy), although his theological writings remained largely unpublished during his own lifetime. Only now is the full corpus of his Biblical writings being made fully available in a major project to put them all up on the web (www.newtonproject.sussex.ac.uk).

John Wilkins was an Anglican Bishop with Puritan sympathies, a founding member of the Royal Society, who frequently started his written discussions in science and mechanics with an examination of Aristotle's views on the subject, but then proceeded to express his own very independent ideas. We should not be 'so superstitiously devoted to Antiquity', wrote Wilkins in the carefully chosen words of a 17th century Bishop, 'as for to take up everything as Canonical which drops from the pen of a Father, ...We must labour to find out what things are in themselves by our own experience...not what another says of them.' When Wilkins uses the word 'Father' in this quotation, he is referring to the ancient classical scholars such as Aristotle, and the word 'Canonical' means 'authoritative'. Only by doing experiments, claimed Wilkins, not just by reading the ancient authorities of classical antiquity, could we really find out how the universe works.

The third way in which Christian theology influenced the thinking of the early European natural philosophers is perhaps counter-intuitive and unexpected, and it relates to the Christian doctrine of the Fall and its perceived impact on the ability of natural philosophers to gain access to truth. The thesis is well expounded in 'The Fall of Man and the Foundations of Science' written by the Oxford historian of science Peter Harrison (Cambridge University Press, 2007). The book summarises a huge amount of historical data to show that the idea that the mind is fallen, a conviction shared by all the natural philosophers of the time, led them to be suspicious of unaided reason as a way of arriving at truths about nature, using the kind of deductive processes familiar in Greek philosophy.

This in turn stimulated the emergence of the empirical method because clearly the only way to establish reliable truths was to do experiments to find out how nature actually worked - this wasn't something that could be worked out from first principles by fallen minds. So in Harrison's view, at its inception, modern science was conceptualized as a means of recapturing the knowledge of nature that Adam had once possessed, so reversing the effects of the Fall.

The point is well expressed by Robert Hooke, who was curator of experiments at the Royal Society, in the Preface to his book Micrographia

(1665), where he notes that 'every man, both from a derived corruption, innate and born within him, and from his breeding and converse with men, is very subject to slip into all sorts of errors….These being the dangers in the process of humane Reason, the remedies of them all can only proceed from the real, the mechanical, the experimental Philosophy'.

Francis Bacon saw the new mechanical philosophy as restoring the knowledge that had been lost since Adam, remarking that 'the subtlety of experiments is far greater than that of the sense itself, even when assisted by exquisite instruments'.

A fourth theme in the scientific revolution that has strongly theological overtones is the enthusiasm of many of the natural philosophers for what came to be known as the new mechanical philosophy, a term virtually synonymous with the new experimental philosophy itself. From our perspective it might seem surprising that machine analogies to describe the properties of the world would be introduced within the context of Christian theology, but the machine for these natural philosophers was always God's machine – they saw no tension between mechanism and meaning. Kepler wrote that 'My aim is to show that the heavenly machine is not a kind of divine, live being, but a kind of clockwork....'

Three natural philosophers in particular were responsible for promoting the mechanical philosophy: the French Catholic Rene Descartes (1596-1650); the French Catholic priest Pierre Gassendi (1592-1655) and the English Anglican Robert Boyle (1627-91). Although their approaches were distinctive, they were all united in their enthusiasm for mechanistic analogies in explaining the properties of matter, and they were equally united in believing that such analogies were valuable theologically in helping people to understand God's creative actions. Robert Boyle called the basic units of matter corpuscules, which were the basis for his famous laws on the behaviour of gases. Boyle's clocklike universe was constructed by a wise God in such a way that it needed no constant adjustment, writing that:

"It more sets off the wisdom of God in the fabric of the universe, that he can make so vast a machine perform all those many things, which he designed it should, by the mere contrivance of brute matter managed by certain laws of local motion and upheld by his ordinary and general concourse, than if from time to time he employed an intelligent overseer, such as nature is fancied to be, to regulate, assist, and control the motions of the parts".

Often in the theological writings of this period we find repeated the idea of the 'Two Books'– referring to the Scriptures as the Book of God's Word, whereas Nature represents the Book of God's Works. Robert Boyle, for example, said that: "As the two great books, of Nature and of Scripture, have the same author; so the study of the latter does not at all hinder an inquisitive man's delight in the study of the former". So in many ways the stance of these early natural philosophers reflects a complementarity model of the relationship between science and religion.

As Kepler put it: 'I had the intention of becoming a theologian . . . but now I see how God is, by my endeavours, also glorified in astronomy, for "the heavens declare the glory of God"'.

Given the rapid development of the new experimental philosophy during the 16th and 17th centuries, it is perhaps surprising how little conflict there was between the natural philosophers and the political and ecclesiastical authorities. It was an era when you could certainly be burnt at the stake for theological heresy, although fortunately that was pretty rare. Yet no natural philosopher of this era was ever killed for their ideas, nor even imprisoned. The nearest we get to heavy-handed suppression of ideas is the house arrest that Galileo suffered at the hands of the Inquisition. Later on during the 19th century the Galileo affair began to be presented as an icon of the conflict thesis, so what actually happened?

Copernicus had published his famous De revolutionibus in 1543, representing his heliocentric theory, with a Preface by Andreas Osiander, the leading Lutheran theologian of Nurenberg, one of his strongest supporters. In order not to upset the Aristotelians, Osiander claimed in his Preface that the book presented only a mathematical theory not physical reality. As it happens, Osiander need not have worried, the first edition ran to only about 500 copies, very few people read the book anyway and it made little impact at the time.

All this changed with Galileo's robust defence of Copernicanism in Italy 70 years later. And to much over-simplify a complex story, there were four key points that eventually brought Galileo into conflict with the ecclesiastical authorities. First he did now have some real data to support the heliocentric theory, although it was not overwhelming, and Galileo began to present Copernicanism as physical fact rather than merely as a mathematical theory. This brought him into direct collision with the Aristotelian cosmology that, as we have noted, had been brought into the heart of the Catholic Church's world-view. Second, this raised the wider question of authority: who had the right to determine cosmological and other scientific truths? This was the period of the counter-reformation when the Council of Trent had firmly re-stated traditional Catholic doctrines in the face of those being promoted by the Protestant reformers such as Luther. It was not a good time to be involved in apparent questioning of the Church's authority. Third, Galileo faced head-on the use of certain Biblical texts by his opponents who used isolated verses in what seem to our ears very bizarre ways to press home the Aristotelian message (e.g. Psalm 93:1). In a brilliant essay published as 'The Letter to the Duchess Christina' Galileo mapped out the scope of Scripture, that it is written for theological purposes, in comparison with the use of human reason and observation, which are there to determine how God's creation works. So without using the same language as Boyle, Galileo effectively came up with his own 'Two Books' hypothesis, and his essay was to prove enormously influential in relating Biblical teaching to scientific knowledge - but at the time the Church was upset that Galileo had taken upon himself to interpret Scripture in a way that was independent from ecclesiastical control.

The fourth point that is highly relevant is that Galileo lacked diplomatic skills: for example he portrayed his old friend and confidant Pope Urban VIII as the foolish Simplicio in his book Dialogue on the Two Chief World Systems (1629), and indeed this was the immediate trigger for his trial before the Inquisition. Galileo was never tortured nor imprisoned, but he was subjected to house arrest back in his native Florence, where he continued his scientific writing and receiving distinguished visitors from the rest of Europe.

The Galileo affair represents, therefore, not a clash between science and faith, but a clash between two different factions within the Catholic Church which centered on the question of authority. Galileo himself remained a loyal Catholic until the end of his days.

6. Can we have a religious science?

It is clear from this brief summary of the emergence of science in the European context that it emerged within a theistic worldview. Furthermore, as we have seen, the theological convictions of the early natural philosophers were important in stimulating the formation of what we now call 'modern science'.

It might therefore seem surprising that in one of the earliest scientific societies to be established, the Royal Society of London that was founded in 1660, the decision was made right at the beginning to focus solely on investigations and discussion of the properties of the physical world, and specifically to exclude discussion of religious and philosophical questions. One pragmatic reason for this decision was the fact that this was an era of great religious controversy, and the early Fellows of the Royal Society realized that progress would be faster if they focused on the science.

But another important reason was the recognition that scientific progress was more likely if investigations excluded questions about teleology and ultimate causation that had been such a feature of Aristotelian science. It was a significant feature of the new 'mechanical philosophy' that it focused on how things worked, not on why they worked. At the same time the Royal Society made a concerted effort to make the language of science more precise, leading in the longer term to the great specialization in the language of science that we see today. The founding of the first scientific journals contributed significantly to this process.

These developments took place within a framework in which the natural philosophers virtually all shared the same theistic worldview, but they did not see themselves as establishing a 'religious science', but rather a science that had its roots deeply in religious convictions. The theistic worldview provides a matrix within which all of science is carried out.

To bring this discussion to the present day, the Christian theologian might certainly see significant problems in bringing religious language into the practice of science itself. Science is an activity that seeks to find out what God has done and continues to do in the created order. Since God is the creator of all that exists, we cannot use God as an explanation for particular aspects of that created order, and not others, because God is the author of the whole of creation, which is like a 'seamless cloth' of His handiwork. Using the book analogy, it would be odd to declare that we had discovered the actions of the author in the second paragraph of Chapter 9 of a book. Either there is an author or there is not; either God is the creator of all that exists or He is not.

This helps to explain why there cannot be a 'religious science' in the sense of bringing the language and concepts of religion into the discourse and practice of daily science. All scientists, whether they know it or not, are investigating and describing the works of God, but they can all share in a neutral, specialized, scientific language in order to carry out and describe the fruits of their investigations. This is how scientists from any country or culture can present their results in international conferences anywhere in the world and be understood by their scientific colleagues. But for the believer, once God is brought in as an 'explanation' for a particular gap in our scientific knowledge, the so-called 'god-of-the-gaps' argument, then there is a great danger in shrinking our concept of God as creator, since this makes it look as if God is just one more causal agency amongst all the other competing causal agencies. But if God is the author of the whole book of creation, then clearly He cannot be a competing causal agency within His own book. There is only one ultimate causal agency for all that exists, and that is God.

When scientists meet together to discuss their results, they can be likened to a conference of airline pilots coming from many different countries to discuss how to fly their planes. Their discussions are focused on particular professional and technical questions, not on the question of where their planes should or should not fly to – those decisions are made by others. Or we can imagine an international conference of car designers, meeting to discuss the latest developments in car design. Their job is not to discuss where all the new cars should go!

So modern science can be carried out by people of any religious belief, or none, and the process of excluding teleological questions from science itself continues to help in making science so successful. For the believer there are good theological reasons, as we have noted, for not wanting to bring theological language into scientific discourse. But of course this does not imply that science is 'anti-religious'. For the believer, all of life is carried out within a theistic matrix, including all of science and all of the humanities. There is no need for the believer to feel threatened by the specialized language of any of these academic discourses, as long as they do not forget who is the ultimate author of the 'book of life'.

7.Can science dispense with religion?

The historical beginnings of modern science may be likened to a rocket being fired into space given a major boost at the time of its launch by religion. But the 'rocket' of science is now proceeding under its own momentum, without the need of the 'energy' of religion that was needed for its launch. Instead that 'energy' is supplied by the integration of the scientific enterprise into the world's economies, by the many applications of science in technology, by the uses of science in health and medicine, and by a vigorous international science community that competes for resources through the writing of grants and the publication of results in he best journals.

What is less clear is whether science can continue to thrive without its religious underpinnings in the longer term. This concern is well illustrated by the influence of post-modern ways of thinking in the western world. One pervasive contemporary post-modern influence is the idea that all truth is relative. In its extreme form proponents of this view suggest that scientific knowledge represents only one perspective on the physical world, and that others, for example provided by a witch doctor in an African tribe, are equally valid for them. Each community, in this view, has its own 'language game' and perspective on the world, and these sets of beliefs are equally valid.

In contrast to the stance of post modernism, science claims that certain things are true and other things are false, in such a way that people from any language or culture can agree on what is in fact the case. DNA really is best described as a double-helix and not as a triple-helix. Scientists can, by their investigations, discover realities about the world that are true for everybody.

There is no doubt that this commitment to truth-seeking and truth-telling was underpinned during the historical emergence of modern science by the theological conviction that God had not only created a rational world, but also created people with rational minds able to obtain true information about God's world. Human rationality was therefore underpinned by divine rationality. True, the idea of the Fall, meant that human rationality was imperfect, but science provided a way of restoring human rationality to its pre-Fall state.

As we have already noted, another great motive of the early natural philosophers to do science was based on their conviction that they were exploring God's world and that their exploration was part of their worship.

It is therefore a question worth asking as to whether the scientific enterprise can be sustained in the longer-term without the rational underpinning and motivation provided by religion, especially if there is a sustained undermining of the notion of true knowledge that is true for everyone. If one day science ceases to be so vital for the world's economies, unlikely as that scenario seems at present, then that question may become more important.

8. Can one separate the domains of activity of science and religion completely?

The late Stephen Jay Gould popularised the notion of science and religion as belonging to 'Non-Overlapping Magisteria' (NOMA) in his book Rock of Ages. Gould maintained that science and religion operate within separate compartments addressing quite different kinds of questions, and therefore there can be no conflict between them virtually by definition. In addition Gould held that science deals with matters of fact, whereas religion addresses questions of ethics, value and purpose. Gould was not the first to hold such a view, but we will use his convenient 'NOMA' label here.

Three main criticisms can be levelled against the NOMA model. The first is historical. Gould himself fatally undermined his own model by writing entertaining essays on key figures in the history of science whose thinking was greatly influenced by their religious beliefs. The constant traffic of ideas between science and religion over the centuries, interactions that continue to the present day, does not support the idea that these human activities lie in separate realms.

The second main criticism rests on the fact that although it is true that science and religion ask distinct types of question about reality, nevertheless it is the same reality that is being addressed in both cases. Science owes its success to the restricted nature of its questions. Nevertheless, even that limited repertoire uncovers facts that to many scientists have religious significance. For example, Professor Paul Davies, a cosmologist who adopts no traditional religious belief, has found that the elegant fine-tuning of the laws that describe the structure of the universe has forced him to consider religious explanations. Such conclusions would be unexpected if a strong version of the NOMA model was correct.

A third problem with the model stems from the rather obvious fact that both science and religion are very human activities. The scientist with religious beliefs working in a research team at the laboratory bench is the same person who worships God communally at other times. Although the two activities are clearly distinct, the brain is simply not designed to compartmentalise different facets of our lives as if they lacked connections. In any case, as we have already noted, many believers who are scientists speak of their sense of worship as they understand more of God's creative handiwork through their research and would not wish to make too sharp a demarcation between their worship of God in the laboratory and their worship within heir religious community, finding powerful synergies between the life of faith and the life of science. Furthermore, religious believers with an evidence-based faith would maintain that their religious beliefs are as factual as their scientific beliefs. Such well-established characteristics of religious thinking and experience do not fit readily with a NOMA model.

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1. What is your definition of science and religion?

Religion is a pathway for the life of humans that seeks to achieve the optimal performance and best level of understanding of the purpose for which humans and the world existed. This is achieved by following instructions brought by prophets and through meditation into a transcendental level of comprehension. Science on the other hand is an endeavor or methodology to discover how things were brought into being and how they function on logical basis. Natural science, specifically, is a method that aims at discovering the algorithms by which the natural world is functioning.

Do you see any conflict between your definitions of these two concepts?

I don't see any conflict between the two definitions; rather the two definitions are complementary and are describing two different stages of knowledge, obtained by two different methodologies. Science investigates this world through rational enquiry whereas religion provides the individual with a set of basic beliefs and allows for the reflections on the natural enquiry through personal contemplations and one's religious experience.

2. Where do you think that there may have been a conflict between the two?

Yes, certainly there have been conflicts between science and religion in the past and there will always be such conflicts. This happens on issues where: either the understanding of religion is short of the facts, or that the level of scientific achievement hasn't reached its climax. In both cases I see that the conflict stems from ignorance.

What have been the grounds for the development of conflict between these two?

Conflicts between science and religion may arise as a result of misunderstanding of the religious people of the content of some of the religious texts. Such confusion might happen because of the preconception that some people might adopt consciously or unconsciously about natural phenomenon or processes. An old example of this was the Galileo Galilei suffering from harassment of the church that was caused by the misunderstanding on the part of the church of the scientific endeavor. One more example at modern times is the rejection of one prominent Muslim clergy of the motion of the Earth and his claim that the Earth is stationary.

In fact this claim was not founded on firm religious basis since nowhere in the Qur'an you find a statement that the Earth is stationary. However, some other religious people follow old outdated interpretations of religious texts and consider it sacred, while such interpretations find no explicit support in religious texts. I had a bitter experience once teaching astronomy to students of the college of Shari'a (Islamic religious studies), there I found that one student was unhappy with my comments on the understanding of Ibn Abbas of some verses of the Qur'an in which Ibn Abbas was reflecting the old Greek interpretations of celestial movements. She rejected my comments on the basis that Ibn Abbas was one of the prominent followers of the Prophet, and that he has been given the knowledge of the divine through the prophet. For this reason alone it was unacceptable for her that Ibn Abbas might be wrong. On another occasion one other student dropped the course telling me that modern astronomy might corrupt his religious beliefs. The problem is that some Muslims elevate the opinions of some old religious figures (like Sahaba, i.e., the early followers of Prophet Muhammad) to the level of sacred texts which is wrong. This is how they fall into error.

On the other hand you find some prominent scientists believing that science and religion cannot be in harmony at all because they have the wrong conception of religion or God. For example, in a debate between Steven Weinberg and John Polkinghorne Weinberg suggested that he could believe in the existence of God if a flaming sword would suddenly appear in the auditorium and get to hit him. Clearly such a request implies that Weinberg believes that if God exists then the universe should be run miraculously. Obviously this is not the case, there is no conflict between having an ordered and a lawful universe and the notion of a supernatural power sustaining such an ordered and lawful universe. Natural laws can never replace the necessity for the divine. On the other side you find most religious people rejecting the notion of biological evolution, an attitude which is in contradiction with observed facts, and at the same time, have no firm support in the original religious scriptures. Rejecting Darwin's scheme of evolution might be an acceptable attitude from one or another perspective, but rejecting evolution completely is something, in my opinion, which is against observed facts and is religiously unfounded. In this respect I should stress that I find nowhere in the Qur'an an explicit rejection of the notion of biological evolution. To the contrary, I find that there are some texts in the Qur'an which implies that there was a kind of divinely guided biological evolution for a creature which has finally developed to be the first homosapien, Adam.

3. What has been the role of religion in the development of science in the West?

Religion has taught the West how to be organized, be faithful for the thoughts and has provided the necessary morals that has developed the ethics of science including being faithful to recognized facts. This is a prime requirement for the scientific enquiry. Philosophy on the other hand has taught the West how to be free in contemplating the world and chase the facts through rational enquiry. These two pillars formed the most important requirements for modern science to emerge.

4. Can we have a religious science?

Religious sciences can flourish and offer the best service to the realm of morals and ethics which is seriously needed for the utilization of scientific achievements in the life of the individual and the society. Science alone cannot provide us with a consistent and efficient system of morals and ethics because science is solely based on rational enquiry that is always incomplete by its own nature. Religion, through its teleological component, is fully qualified to play a moral role and can provide the guidance, including the moral limits, not for our rational enquiry but specifically for the utilization of our scientific achievements. Take for example the changes in the life style that is brought up by the emergence of new technologies; some of these technologies can have bad effects on the life of individuals or societies if left without guidance and limits. It may lead to deterioration and eventual destruction of the society and civilization. Some scientific theories even may lead to wrong philosophies and distorted world view when it present the world as purposeless complex system. In fact whether the world has a purpose or not is not a question for science. Science cannot say its final word on the subjects of its enquiries, never. For this reason, the question of the purpose is a subject of a transcendental enquiry that would start at a rational level and then extrapolate reason to comprehend irrational facts and values, and here comes the role of religion and philosophy. Religion and philosophy which is an extension of religion in some respects are qualified to answer the question on the purpose of our existence. However, since the role of philosophy has been overtaken by modern science there were very little to say about the purpose of our existence and the system of morals and ethics became more like religious beliefs which found no support in modern science. However, as science developed further through the findings of quantum theory and its derivatives we saw a fundamental change in understanding the nature of the world. Instead of being deterministic, events occurring in the world turned to be probabilistic. Consequently, the question comes as who is responsible for controlling the choice of the results in a wide range of possible options. The Laplace deterministic view of the world was abolished and the world is no more a gigantic machine. On the other hand, other phenomenon of the quantum realm, like the non-locality of quantum states, showed that the world is wholly connected and in no way that we can reduce it into fully isolated components. This non-locality of states might be even extended into the realm of a spacetime that goes beyond our physical world, into spacelike worlds for examples that is not well-studied until now. Theories and mathematical contemplations are available that allows for such an extension of thoughts. Out of such observations and through such concepts we could glimpse on a kind of meta-existence that allows us to claim a purpose for our observable world that goes beyond our observed physical world. Here religious contemplations like those of the grand Sufi leaders like ibn Arabi and Mulla Sadra for example, can take the lead in guiding us through original new ways of comprehending our whole existence not through its physical part only but through the whole drive of life and consciousness.

5. Can science dispense with religion?

No, as well as religion cannot dispense with science, both sectors of knowledge in our modern age need each other for a successful and most efficient modern life. Religion need science for guiding ones contemplations not to fall into the abyss of blindness and delusion, and science needs religion for guiding ones sight through the rational enquiry for a fruitful, purposeful results and meanings. Therefore, as far as I can see, none of them can dispense with the other.

6. Can one separate the domains of activity of science and religion completely?

Not completely for sure, but certainly can do that to some extent. The separation will be at work when we deal with the rational enquiry as being an independent purpose on its own so that there should be no obstacle preventing the scientific endeavor. This is necessary for science to flourish and develop freely. On the other hand, when a religious doctrine is developed on certain issue of life science should be consulted to the extent that it does not contradict the plane doctrines of religion and its basic beliefs. This requirement I argue stems from the fact that science is not and cannot be unfaultable. Through the ages we have experienced many occasions in which the scientific view was wrong. Therefore we have to know the limits in each case. So, as we see, both science and religion have their own specialties, their own tools and methodologies but one cannot dispense with the other in our modern age if we would seek a balanced and fruitful ever developing life for humankind.

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1. What is your definition of science and of religion?

The word "religion" and its derivatives in the Semitic languages has acquired a constant relation with law. In the Arabic language, for instance, many legal concepts stem from the verbal root *din* (religion). Thus, *dyyan* is a reference to the judge, and *baitul dyyan* is a reference to the court. It is also worth mentioning that in ancient Hamurabi's laws, the term *din* was used to indicate legal judgment. In the Old and New Testaments, religion means the law of God. In other Western sources, e.g., *Encyclopedia of Judaism*, at least five meanings are given for the term religion: argument, judgment, laws, justice and punishment. In the Islamic sources, the term "religion" is primarily used to denote the belief in the One God. Then gradually it has been used to mean *hukm* (judgment), which is nothing but the Rule of God. Finally, *din* has become – in the Islamic perspective – a reference to three things: the five pillars of Islam, the five pillars of faith, and the main pillars of actions. Turning to the term *Ilm* (science), we find that some Muslim scholars define it as "something for which one does not need a definition" either because it is self-evident or could be attained by intuition. Other Muslim scholars have, however, maintained that *Ilm* means the ability to realize or comprehend things with certainty. This means that when the human mind arrives at a conclusion or judgment with certainty, this is *Ilm*, and they give different kinds of classifications of *Ilm* according to the tools that are used to attain it. In all of those opinions, there is no contradiction between *Ilm* and religion. In fact, there is a lot of literature that has appeared in this century supporting this and probably the part of work that is related to this issue is Maurice Bucay's book on The Bible, the Qur'an and Science.

2. Do you see any conflict between your definitions of these two concepts?

I have written an article on the definition of *din*. It is about 24 pages and I have another article on the definition of *Ilm*. Going through all sources, I can hardly see any kind of contradiction between *din and Ilm* though they may function into two different fields. Those who have claimed that there is a conflict between *din* (religion) and *Ilm* (science) have adopted another definition for the two. In their opinion, *Ilm* is something that should be testable in the lab or should be experimental and tangible. This view is not acceptable in the Islamic perspective within which there is no conflict between *Ilm* and *din*, since both of them are a kind of bounty from God.

3. Where do you think there may be a conflict between these two?

Same as # 2.

4. What have been the grounds for the development of conflict between these two?

During the European Renaissance, the Church rejected most ideas that scientists held about the earth, or heaven, etc.; because the Church mixed the revelation, which is certain and unchangeable, with the interpretations of the Father's religious leaders, which is relative and uncertain. In this, they were mistaken. They gave the wrong impression that there is a constant contradiction between religion and science. As Muslims, we didn't face this problem in our history, because our scientists and our religious scholars based themselves on revelation (e.g. Qur'anic teaching). That makes religion and science from the Islamic perspective two in one.

5. What has been the role of religion in the development of science in the West?

We can say, for the time being, that there is a kind of awakening, especially in America. There are a lot of academicians and scientists, especially from the Catholic community, who believe that the West has lost a lot by this assumed conflict between religion and the sciences. They believe that such a gap should be closed and that the bridge rebuilt between values and the sciences. You can find thousands of professors and institutions working to rebuild the relationship between science and religion. And if we follow the journals, the media, and the Internet, we can see that.

6. Can we have a religious science?

Yes, we can have a religious science, and I think the attempts of the IIU in Malaysia, IIU in Pakistan and the Iranian Higher Education system; Sudan, Saudi Arabia, especially in Imam Mohammad Bin Sa'ud University can attest to that. We will find a lot of serious work in this regard. At the same time, the Catholic academia is working very hard to achieve something in this regard. In my humble opinion, if we concentrate on linking the sciences with values and consider the revealed messages as a source of knowledge with some change in the philosophy of science, that will help to put science and religion together again.

7. Can science dispense with religion?

Same as # 6.

8. Can one separate the domains of activity of science and religion completely?

No, because religion in our view, shapes our outlook and our paradigm, and it is impossible to be totally immune against religious influence when we approach the scientific research.

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Publications: He authored 12 books and more than 120 book chapters and articles on Islamic thought and civilization. His books include *Classification of Knowledge in Islam*, *Tawhid and Science*, and *Islam and Civilizational Dialogue.*

1. What is your definition of science and of religion?

Today different groups of people are found using the word science in different senses. At the popular level, people of various religious beliefs and cultures are using the term to refer to the study of the natural world. Moreover, they understand that study to be limited in its methods to its modern practice, namely the empirical. In other words, the popular understanding of science is limited to modern science. At the academic level, the word science is understood in a wider sense as illustrated by the usage of terms like natural science and social science. Although in this case the usage of the term science has been extended to the social domain, the methods of study considered legitimate for the discipline are more or less identical to those of modern natural science form which in fact they have borrowed with little modifications.

In this broader usage of the word science, we see an attempt to understand it not as meaning a particular branch or domain of knowledge but as a particular type or form of knowledge that seeks to understand the different domains of reality. While the layman understands science as a branch of knowledge, namely knowledge of the natural world, the academic community understands it as an academic discipline that seeks to study its subject matter by means of methods collectively labeled as ‘scientific’. There are those who think even the term religious science is legitimate, though theirs is a minority view.

The idea of science as an academic discipline concerned with domains of study ranging from natural to religious phenomena has an important place in Islamic intellectual thought. Muslim classifications of the sciences composed over the centuries, by authorities in different fields of study, prove beyond doubt that such an idea of science found general acceptance in Muslim scholarship. Muslims use the word *‘ulum* (singular: *‘ilm*) to refer to all the known academic disciplines that treat their respective subject matters ‘scientifically’. But the traditional Muslim understanding of ‘scientific’ (*‘ilmi*) is not the same as in mainstream modern scholarship.

For a particular study to attain the status of a science or a scientific discipline, it must possess the following: [a] a well-defined subject matter or domain of study; [b] clearly stated assumptions of a generally philosophical nature about the subject matter that could only be proved in another discipline which is more embracing and thus ‘higher up’ in the hierarchy of truth claims; [c] methods of study and research appropriate to the subject matter; and [d] specific epistemic or theoretical goals to be achieved. From the methodological point of view, the emphasis here is on the need for each science to use methods of study appropriate to its subject matter. This means religious sciences and natural sciences both can be scientific although they may be employing different methods of study. One important consequence of this conception of science and scientific is that it helps to prevent a particular science from usurping the role and functions of another science. In the absence of such a conception, however, the opposite situation has happened, as can be seen in the phenomenon of modern science. If many Muslims have criticized modern science, it is because by making sure truth claims it has, in fact, transgressed its legitimate epistemological boundaries to usurp the functions of the metaphysical and religious sciences.

If science is to be limited to the study of the natural world, then we can define it in two different ways. One is to identify science with exclusively empirically-established body of knowledge of the natural world, as is the current practice in modern science. The other is to identify science primarily with the empirical knowledge of the natural world, but the validity of the non-empirical content of science is also acknowledged. This second definition would be more in conformity with traditional Islamic science.

Compared to science, religion, given its complexity, has given rise to an even wider range of definitions. But, in spite of the diversity of the phenomena of religion, I think there are enough fundamental elements common to the structural contents of all the religions to allow us to come up with the most universal definition of religion possible. Religion is a system of doctrinal beliefs about divine reality, the cosmic reality originating from it, and human relations with the two orders of reality, and a system of rituals and practices, both individual and collective, that aim at the fulfillment of man's relations with the divine and fellow humans. Religion is then both a way of knowing and believing and a way of doing things. The main source of both dimensions, doctrines and practices, is believed to be revelations of divine origin. I think our definition of religion is acceptable to followers of all religions.

2. Do you see any conflict between your definitions of these two concepts?

Conceptually, I do not see any conflict between the definitions of science and the definition of religion that I have given. Even the narrower definition of science as empirical knowledge need not be in conflict with religion as I have defined it. But between the two definitions of science, the second being inclusive of non-empirical knowledge, one finds greater favor with religion. In practice, however, conflicts have occurred in several areas between modern science and religion.

3. Where do you think there may be a conflict between these two?

[1] The first possible area of conflict is in the interpretation of empirical facts that are of interest to both religion and science. Men of religion and men of science may interpret the same body of empirical facts differently and sometimes in conflicting ways. For most scientific facts, religion is either supportive of them or indifferent to them, though some religions tend to be more appreciative than others of what scientific interpretations can mean to religious beliefs. But when it comes to fundamental issues like the origin and end of the universe and the origin of the human species, religion takes a very serious stand.

The possibility of conflict between religion and science is greater on such issues for two main reasons. First, religion depends for its answers to such questions of origins largely on data of revelation which, for various reasons, modern scientists do not want to entertain. Second, the issues of origins of the universe and of humans concern cosmic events and phenomena that happened far back in time. With hardly sufficient empirical facts at their disposal, scientists rely a lot on interpretations and theorizations, some of which may well turn out in to be contradictory to religious beliefs. As a matter of fact, the theory of evolution to explain the origin of humans as advanced by science is widely seen, in a number of religions, as contradictory to the scriptural accounts of human origins.

[2] The second area of conflict is over the question of how humans can gain knowledge of reality. Many scientists adopt the view that the scientific approach as understood in modern science is the only valid and reliable way to know reality. In the name of science, they deny the existence of orders of reality that cannot be known through empirical methods of inquiry. What amounts to the same thing, they deny the possibility of having forms of knowledge than empirical knowledge. But there are also many scientists who do not share that view. Religion as a way of knowing is emphatic in rejecting such a view. It maintains there are other avenues to knowledge. The most important of these are revealed scriptures and intellectual intuition. Religion can accept the view that empirical methods are the best of methods to help

man understand physical reality, but it views these methods as incompetent to reveal realities beyond the physical world. Where science fails, religion takes its place.

Religion as a way of knowing makes truth claims about the divine and the non-physical cosmic realities as well as about man's higher cognitive powers. In the light of these claims, religion makes human access to the spiritual world possible. It has also proved to be more competent than science in revealing holistic knowledge of things, including a holistic knowledge of the physical world.

[3] The third area of conflict considered here pertains to ethics of knowledge. Religion as a way of doing things stands for the best of ethical conduct. It is the best source of ethical values to guide the scientific community in its scientific research and applications of knowledge. Clearly, there have been many ethical violations in the practice of modern science. But from the point of view of religion, worse than the ethical violations by individual scientists is the entrenched view within the scientific community that believes scientific progress is only assured if science is free of ethical constraints as preferred by religionists.

4. What have been the grounds for the development of conflict between these two?

Historically, the first large-scale conflict between science and religion in the world began in the modern West with the Scientific Revolution. For studies of the natural world, the traditional Christian view of the universe came to be replaced by the scientific world-view. According to this scientific world-view, the only legitimate view of the cosmos is the one established by modern science. There was a philosophy that supported that scientific world-view. That philosophy was antagonistic toward medieval Christian theology, particularly its conceptions of nature and its general attitudes toward human reason. That philosophical antagonism has its roots in the debates on natural theology, during the Renaissance, between men of religion and men of science. As the new science progressed and made more and more new discoveries, it opened up a new world of ideas that tended to marginalize Christian theological thought. It was unfortunate that after the Scientific Revolution Christian theological thought lost its intellectual zeal to make meaningful and effective responses to the various philosophical currents underlying the growth of modern science.

Responses that were truly intellectual in nature were lacking on the theological side, when these were precisely what mattered most. Consequently, the conflict between science and religion deepened in the modern West. But with the development of the new philosophy of science and its growing dominance, we also saw religious individuals and groups embracing the new science and contributing to its growth and development. We can then say that the modern conflict between the two can be traced to that point in Western intellectual history where theology proved powerless to formulate a religious view of nature and of science that could meet the intellectual and rational needs of scientists.

5. What has been the role of religion in the development of science in the West?

The role of religion in the development of science in the West varied over the centuries. During the medieval period until the 15th century Renaissance religious thinkers provided the theological and cosmological frameworks of science. Scholastics like St. Thomas Aquinas attempted to integrate philosophical and scientific ideas, largely borrowed from Islam, into a Christian theological perspective. Scientists like Roger Bacon, under the influence of Muslim scientists especially Avicenna, sought to affirm the unity of religion and science within the context of Christian thought. Both men of religion and men of science were committed to the idea of unity of religion and science.

During the Renaissance, many men of science were still committed to the unity of religion and science, although they had begun to embrace a new natural theology that gave greater importance to reason and science than what earlier theologies had accorded. During the modern period beginning with the Scientific Revolution in the 16th century, when European thought underwent a major structural transformation, we have witnessed the declining role of religion as an institution in influencing scientific thinking and development.

The Church became resigned to the separation of religion and science both at the level of ideas and in practice. Many religious individuals became scientists, but their scientific thinking and practice was not different from that of scientists who were skeptical and critical of religion. There were exceptions. Isaac Newton may be better known for his modern physics but very few people know about his deep interest in alchemy which during his time had lost its 'scientific' status.

Perhaps among the religious groups, the role of the Jesuits in promoting modern science, since the middle of the 16th century, is very well-known. Generally, we can say that religion has been made irrelevant to the pursuit of science and the societal organization of science, as an institution.

6. Can we have a religious science?

Yes, I think we can. By 'religious science' I mean a science embracing the physical, biological, mathematical, and cognitive sciences with characteristics that conform to the religious world-view and religious ethical values. To explain what I mean, let me go back to my definitions of science and religion. The definition of science favored by medieval Muslim scientists has three elements that can be conceptually related to religion. These elements are the philosophical premises pertaining to the subject matter, methods of study used, and theoretical objectives of the study. The philosophical premises could be drawn from cosmological ideas in religion; methods and theoretical objectives of study could conform to religious epistemology whereby the legitimacy of non-empirical approaches to knowledge is admitted. If the three elements that go into the definition of science can really be made to conform to religious perspectives on cosmology and epistemology, that are really metaphysical in nature, then, we say the science in question has assumed the characteristics of a religious science.

But this religious characterization of science pertains only to that science's conformity with religion as a way of knowing. There is another side to the religious character of science, namely the conformity of its practice with religious ethics. Before the rise of modern science, the sciences cultivated in different human civilizations had all assumed a religious character in both senses. Islamic science, the immediate predecessor of modern science and with which it has several characteristics in common, was truly religious. In the light of this historical precedence, it is not impossible to have a religious science in the 21st century. However, there are numerous obstacles that need to be overcome both at the conceptual and institutional levels. Given the pluralism in the world's religious ethical systems, I think, of the two sides or aspects of religious science that I have defined, the more difficult to realize would be a scientific practice that conforms to a commonly agreed ethical code of conduct. In the contemporary Islamic world, there are numerous intellectual groups and educational centers making attempts to revive the idea of religious science within the context of Muslim culture.

7. Can science dispense with religion?

The question of whether or not science can dispense with religion is no longer a matter of intellectual interest and conjecture. We have already seen a science that has dispensed with religion. This is modern science. Modern science has made religion irrelevant to the pursuit of knowledge in general and the pursuit of science in particular. An important question we should ask in this respect is what the consequences have been on the quality of human civilization as a result of modern science dispensing with religion. Admittedly, modern science has made great contributions to scientific and technological progress in its material aspects. But in spiritual and moral terms, modern science's destructive consequences on human life and civilization have far outweighed its positive contributions.

The problem with modern science is that it is more than just a science of nature in the proper sense of the word. It is also a world-view, a vision of reality, a philosophical outlook, and a judge of rights and wrongs. In that sense, modern science is another "religion" that has usurped the role and functions of traditional religion but forgetting or remaining indifferent to its spiritual and ethical values. It is precisely because of that usurpation that modern science, through the kind of intellectual and moral impact it has produced, has led to the impoverishment of time-honored human values. The question before us then is whether or not the world can survive the 'cosmic' impact of a science that continues to dispense with religion.

8. Can one separate the domains of activity of science and religion completely?

This question is closely related to question 7. I do not think we can totally separate the two domains. These two domains are not mutually exclusive. Rather, they overlap in a number of areas. Religion as a way of knowing overlaps and interacts with science as a way of knowing. In one sense, the former embraces the latter as Islam for example would like to view it. Islam, the religion, views the empirical method as one of the legitimate approaches to knowledge. Moreover, the deepest significance of the scientific method and scientific knowledge can only be realized not by viewing them outside religion but within the spiritual and metaphysical context. The interests of both religion and science are met when we insist on their interrelationship and unity. Echoing Albert Einstein, we can say that religion and science are in needs of each other. Islamic science was a good example of the fruitful interactions and overlap between religion and science.

Similarly, religion as a way of doing things overlaps with science as an activity. Human activities cannot be divorced from ethical questions. An integral religion like Islam would see every human activity ethically meaningful. Scientific activities are no exceptions. Each of them carries an ethical value, be it positive or negative. Science as an activity is not value-free, ethically speaking. Religion as the most effective source of ethical values is in a position to inspire scientific progress on a moral and ethical foundation. To separate the two domains would lead to the same kind of losses to humanity that I mentioned in question 7.

Dr. Richard H. Bell

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Publications: *Provoked to Jealousy: The Origin and Purpose of the Jealousy Motif in Romans 9-11* (WUNT 2.63), Tübingen: J.C.B. Mohr (Paul Siebeck) 1994; *No One Seeks for God: An Exegetical and Theological Study of Romans 1.18-3.20* (WUNT 106), Tübingen: J.C.B. Mohr (Paul Siebeck) 1998; articles on atomic physics, theology, science and theology.

1. What is your definition of science and of religion?

Science can be defined in its broadest sense as "an attempt at comprehension and exposition, at investigation and instruction, which is related to a definite object and sphere of activity" (K. Barth, *Dogmatics in Outline*, London 1949, p. 9). Science is a rational exercise. It is also an objective exercise in that the knower should be open to the disclosure of the object and ideally should not impose upon the object *a priori* assumptions about the object; rather he should be open to the object. Science also involves a combination of theory and practice; but, the precise way in which they are combined, depends on the particular object of enquiry. This is my broad definition of science and such a definition would embrace theology. But there are many different sciences and each science requires a particular method which is suitable to the object of its enquiry. The particular science which these questions concern is natural science. Natural science includes disciplines such as physics, chemistry and biology. The object of enquiry is the natural world; and in this, an attempt is made to discern the "laws of nature" and the structure of the natural world whether this concerns an atom, a molecule or an organism. In such sciences, there is a particular combination of theory and experimentation. The knower does not come to the object of enquiry with no presuppositions. Rather, he comes with some sort of hypothesis which in turn shapes the nature of the experiment. Hypotheses can then be revised or rejected on the basis of experiment.

Theology, I would define as the science of God and in such a science, it is necessary to have an appropriate method of enquiry. But I have been asked to define "religion". This is a little more difficult to define because there are many "religions" and the theological discussion about "religion" has been extremely complex. For example, many Christian Protestant theologians have been critical of "religion", seeing it as a human attempt to find God. K. Barth considered religion in one sense as unbelief (*Church Dogmatics*, 2.1: 297-325). Such a definition is not particularly helpful for this questionnaire so I will adopt the following definition of F. Burmann (1632-79). Religion is "the right pattern of knowing and worshipping God" (*recta Deum cognoscendi et colendi ratio, Synopsis theologiae* 1.2.4, quoted in R. A. Muller, *Post-Reformation Dogmatics: Volume 1*, Grand Rapids 1987, p. 117). Such a definition of "religion" is not that different from a definition of theology as the "science of God".

2. Do you see any conflict between your definitions of these two concepts?

If "religion" is related to "theology" as the "science of God", and if "science" (i.e. "natural science") is the "science of the natural world", there appears to be little or no conflict between the two. Each has its own sphere of activity. But in practice, there clearly has been some conflict between "science" and "religion".

3. Where do you think there may be a conflict between these two?

A conflict may arise where the two areas of "science" and "religion" overlap. I take the example of the origin of the universe. Genesis 1 of the Hebrew Bible says that God created the world in six days. The word "day" clearly means a period of 24 hours. See Exodus 20.9-11: *"Six days you shall labour... but the seventh day is a Sabbath to the LORD your God... for in six days the LORD made heaven and earth, the sea, and all that is in them..."*. Yet this clearly conflicts with the findings of astronomy, geology and biology. Using the Hebrew Bible James Ussher, Archbishop of Armagh and John Lightfoot, Chancellor of Cambridge University, calculated that God created the world in 4004 BC. Although there may be some disagreement among astronomers, geologists and biologists about the age of the universe, the earth and life, hardly any would accept that universe is just 6000 years old.

I have given an example where a religious text conflicts with the findings of science. Another example where science and religion can conflict is where science believes it has disproved some aspect of life which "religion"believes is crucial. So some have claimed that science has disproved the existence of the human soul. Scientists have not found a soul. Is the human being not simply a body, and is not our thinking just brain activity? So it is claimed that science can dispense with religion.

4. What have been the grounds for the development of conflict between these two?

One reason for the conflict is that "religion" has said something about the natural world which clearly does not fit in with the findings of science. This has been seen to be the problem in the case of the creation of the universe. Another reason for the conflict is when a reductionist view of science is adopted, that is that everything can be reduced to the lowest possible level of enquiry. Such a view is seen in my second example above, the case of the human soul. A human being is "nothing but" a collection of molecules and thinking is nothing but a series of electrical impulses in the brain.

5. What has been the role of religion in the development of science in the West?

Despite the conflict that has arisen between religion and science, it is striking that religion has been a key factor in the development of science in the West. I accept many of the conclusions of R. Hooykaas' book, *Religion and the Rise of Modern Science* (Edinburgh, 1984; 1st ed., 1972), that Protestantism, especially Calvinism, played an important role in the development of science. So, for example, the positive attitude towards manual work in Protestantism encouraged experimental science. Hooykaas also points to the striking way in which science flourished in 17th and 18th century Protestant cultures. So, for example, when the Royal Society in England was founded in 1660-62, the majority of its members were Puritans (i.e. Calvinists). More generally, I believe one can make the following two points about the way religion has had a positive effect on the development of science in the West. First, if there is a God who created the universe, and if this God is rational, one may assume that the universe has an inherent intelligibility which reflects the rationality of God. Second, if one believes that nature itself is not divine, but rather is simply God's creation, it seems acceptable to do experiments on the natural world. The Greek view of the deification of nature may well have hindered the experimental aspect of their scientific work.

6. Can we have a religious science?

A religious science is possible in three respects. First, it may be possible to have a science based on religious principles (for example, a science where experiments are responsibly carried out, where there is respect for the environment, etc.). Secondly, it may also be possible to make certain judgements in science and in the philosophy of science based on theological principles. For example in Quantum Theory, a religious science may involve a realist view of the world (i.e. there is a universe existing independent of our observing it). So Einstein, a Jew, was unhappy with Quantum Theory as it was understood by physicists such as Niels Bohr. Further, Einstein had theological problems with the alleged indeterminacy in Quantum Theory. In his reply to one of Max Born's letters in 1926, he wrote: "Quantum mechanics is very impressive. But an inner voice tells me that it is not yet the real thing. The theory produces a good deal but hardly brings us closer to the secret of the Old One. I am at all events convinced that *He* does not play dice". Einstein therefore believed that Quantum Theory was incomplete and would be superseded. The third way in which one can have a religious science, is to consider that any science at its peak can become theology. K. Barth writes this: "*Theology does not in fact possess special keys to special doors. Nor does it control a basis of knowledge which might not find actualisation in other sciences. Nor does it know an object of enquiry necessarily concealed from other sciences... All sciences might ultimately be theology*" (*Church Dogmatics*, 1. 1. 5-7). But he goes on to write that science in fact has not become theology: "*The separate existence of theology signifies the emergency measure on which the Church has had to resolve in view of the actual refusal of the other sciences in this respect*" (7). Building on this, some scholars have gone on to speak of a necessary "liberation of science" (see, for example, G.T. Stavenga, *Science and Liberation*, Amsterdam, 1991).

7. Can science dispense with religion?

In one sense, science can dispense with religion, for science does appear to have a certain autonomy. So physics, for example, has its own language, logic and method. Some of the best physicists are atheists. However, science does have a metaphysical basis. It assumes the world is intelligible; it assumes that there are laws of science. Religion can provide science with precisely such a metaphysical basis. If God is rational, His creation can have a certain intelligibility. If there were no God, there would be no reason why the universe should be lawful. Religion can say that the laws of nature reflect God's rationality; the laws of nature also reflect God's faithfulness.

8. Can one separate the domains of activity of science and religion completely?

As said above, science does rely on certain metaphysical assumptions which religion may be able to provide. So in one sense, science needs religion. Does religion need science? Perhaps it does. As science develops, our world view develops, and it is necessary to restate the truths of religion in a new language. So in the light of Einstein's theory of relativity, our view of time has changed radically. Time cannot be separated from space; one must speak of space-time. So if God is outside of space, he must be also outside of time. In certain respects, though, science and religion have to be separated. I mentioned earlier the conflict between religion and science in the matter of creation. The account in Genesis does not tally with modern science. But does not Genesis still have something to say? I believe it does. It is not a biology textbook. But it tells us that God created "Adam", the first man. He is the pinnacle of God's created order, created in God's image. But he sinned and turned away from God. He "fell" and was cast out of the Garden of Eden and a curse came upon creation. The Jew, Paul of Tarsus, who was converted to the Christian faith, said that we all participate in the fall of Adam (Romans 5.12-21). This is the fundamental human problem. Such language could be called mythological language. It is not the language the physicist would use, but nevertheless it has its own validity. So the essential element in the creation account found in Genesis is not *when* God made the world or made Adam, but the fact is that he made Adam as the pinnacle of his creation. But Adam fell, and his fall has affected us all. We are under the power of sin, a power from which we need to be redeemed.

Prof. John Hedley Brooke

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Post-Doctoral Professional Experience: Dr. John Hedley Brooke is the Andreas Idreos Professor of Science & Religion and Director of the Ian Ramsey Centre at the University of Oxford, where he is also a Fellow of Harris Manchester College. Before moving to Oxford in October 1999, he was Professor of the History of Science at Lancaster University. A former Editor of the *British Journal for the History of Science*, he has been President of the British Society for the History of Science and of the Historical Section of the British Association for the Advancement of Science. In 1995, jointly with Professor Geoffrey Cantor, he gave the Gifford Lectures at the University of Glasgow. He is currently Director of the European Science Foundation's Network on "Science and Human Values"; and in November 2001, he gave the "Distinguished Lecture" of the American History of Science Society in Denver.

Publications: His main books are *Science and Religion: Some Historical Perspectives* (Cambridge University Press, 1991); *Thinking About Matter: Studies in the History of Chemical Philosophy* (Ashgate, 1995); and (with Geoffrey Cantor) *Reconstructing Nature: The Engagement of Science & Religion* (T & T Clark, 1998; Oxford University Press, 2000). With Margaret Osler and Jitse Van der Meer, he recently edited *Science in Theistic Contexts: Cognitive Dimensions* (Published as *Osiris* vol.16 by University of Chicago Press, 2001).

1. What is your definition of science and of religion?

As a historian of science, I often find myself recoiling at an approach to the discourse of 'science & religion' that begins with definitions. I appreciate the need for clarity of thought; but I also recognise that the word 'science' has changed its meaning several times during the last two thousand years. It is also clear that what people understand by 'religion' varies enormously from one culture to another. The word 'science' once meant any organised body of knowledge. That included knowledge of God; hence, the characterisation of theology in medieval Christendom as 'queen of the sciences'. In its subject matter and in the importance of its consequences, it represented the highest form of knowledge to which one could aspire. Within Aristotelian philosophy, which continued to dominate much of the intellectual life of Europe until the seventeenth century, the word 'science' also signified a body of *demonstrable* knowledge by contrast with speculative reasoning and with forms of philosophy that could only yield conclusions of greater or lesser probability. This helps one to understand how the great English philosopher John Locke could say at the end of the seventeenth century that he did not see how natural philosophy (which we often see as the precursor of modern physics) could ever become a science.

When Isaac Newton published his *Principia* (1687), its title referred to the mathematical principles of *natural philosophy* not of natural *science*. This is important because by natural philosophy, Newton understood a discipline that embraced more than physics in a narrow sense; it also included discourse about the activity and attributes of the deity. To ask how Newton reconciled his 'science' and 'religion' would therefore be to ask an anachronistic question. In the modern period, the word 'science' has come to denote a specialised enquiry into the workings of nature in which mathematical modelling and the experimental testing of hypotheses have played an indispensable role. The crucial role of mathematics as the language in which the 'ideal case' can be constructed, was famously recognised by Galileo whose legacy (and that of Newton) was nicely captured by the French intellectual historian Alexandre Koyre when he wrote that what was characteristic of the revolutionary methods of the seventeenth century was the explanation of the 'real' by the 'impossible'. Predictions based on the mathematics of an ideal case could be compared with new experimental results in a real world that was always more complicated.

A second reason for declining to over-define the word 'science' concerns the diversification of methods and practices that have been employed within different scientific communities. There are many sciences, not one. As long ago as the 1830s when the Cambridge mathematician and philosopher William Whewell first coined the word 'scientist', he insisted on differentiating between the sciences. Each specialised form of enquiry was regulated by its own distinctive 'fundamental idea'. Chemistry, for example, was dominated by the idea of electrical polarity; crystallography by the idea of symmetry; anatomy and physiology by the idea of 'final cause', the purpose for which a particular organ or structure was designed. The historical sciences, such as paleontology, had special requirements and assumptions because they involved the reconstruction of processes in the past to which there was limited direct access. The attempt to define 'science' by reference to a distinctive (and privileged) *method* has also run into difficulty because great insights in the sciences have often come about through forms of creativity that cannot be formalised. This point was forcibly made by the philosopher of science Paul Feyerabend in his controversial book *Against Method* (1975). When speaking of scientific 'methods', it is also important to recognise that formal accounts of what scientists do are often designed for consumption by a general audience and may not accurately describe how a particular piece of scientific work was really done. This is a further reason for skepticism about whether the word 'science' can be adequately defined. If we say that science is what scientists do, they do very many things!

The word 'religion' is just as difficult to define. It can be used in a very broad sense to denote a set of beliefs or values by which an individual or community of believers give meaning and orientation to their lives. It is sometimes used in a much narrower sense to indicate some kind of belief in the transcendent, some reality beyond the 'natural' world. In the monotheistic religions, there is reference to the divine Creator of all that is, but this would not be a feature of most Buddhist traditions. Some would even argue that the word 'religion' is an artefact of the European Enlightenment as other cultures were more systematically studied than before and some overarching structure was required to understand the rituals and practices of contrasting civilisations.

It is in the context of the study of 'comparative' religion that the quest for some common structure in all religions still persists, but it is increasingly recognised that even the world's main religions cannot be made to fit a common mould or definition. In some, as in Christianity, there is a long tradition of theological reflection on the meaning of faith and worship; in others, the practice of an elaborate series of codes of behaviour has been a dominant characteristic. Even within one and the same 'religion', different traditions have developed distinctive sets of values and beliefs. Whereas in the Western Christian traditions an interest in the sciences has often been sustained through a commitment, however limited, to forms of natural theology, this is not so visible in the Eastern orthodox tradition.

2.Do you see any conflict between your definitions of these two concepts?

Because I have been reluctant to give overarching definitions, I am equally reluctant to answer this question in a way that would depend on formal definition. I would stress the need to study the practices of scientists and religious believers and to see how they co-exist where they do. Because some of the greatest scientists have been devout (though often unorthodox) religious believers, it seems fairly obvious that there need not be irresolvable conflict, even if there has sometimes been a tension in their lives or in their relationship with religious authorities. This is not to deny that conflicts have arisen in specific times and places, in each case for reasons that the historian must investigate.

One cause of conflict has been the tendency in religious traditions to cultivate cosmologies that have a strongly mythical character but which make some reference to the natural world and how it should be conceived. When the sciences advance, providing alternative explanations for natural phenomena, conflict can arise. There has been a temptation for religious apologists to base arguments for the existence of God or for divine providence on features of the world that are seen as inexplicable by the sciences. This is another kind of mistake; because, as scientific progress closes the gaps, so the God employed to fill them becomes progressively redundant. Conflict can arise when sacred texts are interpreted in ways that clash with the latest scientific knowledge, as when the Genesis creation narratives are used to contest the truth of evolutionary theory. In such conflicts, the question of authority also arises, as it did in nineteenth-century England when a new generation of professional scientists, typified by Thomas Henry Huxley, tried to usurp the cultural authority that had traditionally belonged to the clergy of the Anglican Church. Conflicts can also arise as a consequence of the methods used by the sciences. For example, it is a principle of method in the physical sciences that one looks for a naturalistic explanation for the effects one is studying. Success in applying this principle of methodological naturalism can easily lead to the conclusion that all references to the supernatural are unnecessary for interpreting one's place in the universe. Yet, another source of conflict can be the material culture of the sciences, leading to a suspicion of references to spiritual values or realities. This has been particularly significant in the development of the human sciences where it is now often claimed that mental phenomena arise from particular states of the brain and that no references to a spiritual substance or immortal soul are necessary. From the middle of the nineteenth century, conflict has arisen as a consequence of positivist philosophies in which propositions incapable of verification are deemed unworthy of belief. In crude versions of this philosophy, scientific knowledge is seen as empirically verifiable and therefore far superior in status to religious beliefs or opinions that are simply taken on trust.

With so much potential for conflict, it is easy to imagine that the history of the relations between the sciences and religious traditions is nothing more than a story of repeated hostilities. This would be seriously misleading. It is true that the universe has become far larger and far older than was once imagined. This may make it difficult to believe that individual human beings are of any special significance or interest to a divine being. Charles Darwin considered it extremely arrogant for men and women to think they could reason their way to God or to believe that they were worthy of divine attention. Accumulating examples of conflict, however, misses the point that scientific advances have frequently been appropriated by religious believers to strengthen their faith. This still happens today, as is clear from recent discussions of the anthropic coincidences and their use in arguments for the fine-tuning of the universe in its earliest moments. Even the most damaging scientific results can usually be interpreted in ways that leave the essentials of a religious creed untouched. For example, the Darwinian theory may undermine the once popular belief that God had created each species separately, but it did nothing to undermine the doctrine of Creation in its more fundamental form, namely that everything that exists ultimately depends on a transcendent power for its being and for its continued existence. In this case, as in many others, it would be incorrect to say that scientific theory *entails* a unique set of conclusions destructive of religious belief. In determining the cultural meaning of new forms of science, everything depends on the preconceptions that we bring to the discussion. It is not uncommon for theists and atheists to use the same science as a resource for their propaganda.

3. Where do you think there may be a conflict between these two?

4. What have been the grounds for the development of conflict between these two?

When speaking of the *grounds* of the development of conflict, it is important to stress that objections to religious belief have often arisen for reasons that have nothing to do with science. The intolerance shown by religious authorities to those of other religions has been a common source of resentment, as it was for Voltaire in eighteenth-century France. The use of 'science' to attack religious sensibilities may be grounded in a pre-existing rejection of religion for a variety of other reasons. The conflicts that took place in mid-nineteenth-century England, reflected the fact that education had been largely in the control of the clergy, with the consequence that the sciences had enjoyed a very low profile in schools and universities. In England, since the middle of the seventeenth century, it had been common for the clergy to participate in the study of natural history, where nature was seen as the work of a divine Creator. During the years in which Darwin published his theory of evolution by natural selection and Huxley came to its defense, a more rigorous approach to the study of natural phenomena came to the fore in which references to divine design gradually disappeared. As part of this process, the clergy were gradually squeezed out of mainstream scientific activity. Among the grounds for the development of conflict, one would have to include the formulation of new ideas about nature that were shocking to conservative upholders of religious belief. For example, if one believed in the doctrine that human beings had been made in the image of God and had a unique identity and dignity in creation, it could be truly shocking to learn of one's animal ancestry. It was shocking to Darwin's wife, Emma, to be told that the moral sense had evolved through a long natural process and was not to be seen, in any straightforward way, as a divine gift.

In exploring the grounds of the development of conflict, it must also be recognised that religiously grounded opposition to some forms of science has been sustained by the association of those forms with certain liberal values that are perceived as dangerous to the faith. Creationists in the United States who attack Darwin's theory of evolution often treat the name of Darwin as a symbol for what they see as evil social tendencies – the favouring of abortion, for example, or tolerant attitudes towards homosexual practices. It is such associations of ideas that require further historical research. Creationists who attacked Darwinism in the 1920s, the decade in which the Scopes trial took place in America, were concerned among many things, by the way in which Darwinian ideas were being used to justify prospective eugenic programmes. Religious identities can be forged and sustained by oppositional stances.

5.What has been the role of religion in the development of science in the West?

Questions about the role of religion in the development of science in the West are notoriously difficult to answer. At least three considerations make it necessary to exercise caution when addressing this issue. First, it can be artificial to isolate religious factors when ideally one should take into account the entire complex of social, economic and political circumstances that facilitated analytical approaches to the study of nature. Second, we have inherited a legacy in which it is assumed that religious values and beliefs were only obstructive to scientific development. In correcting this insensitive image, it is easy to exaggerate the positive contribution of religious cultures. Third, such exaggeration is often driven by apologetic motives, as when representatives of religious traditions claim a special relationship between their particular tradition and scientific development.

Despite these problems, it is possible to argue that within the main monotheistic religions there were resources that could be invoked to justify the pursuit of the sciences. Following the taxonomy, I employed in my *Science and Religion: Some Historical Perspectives* (1991), I would contend that theistic beliefs were able to provide one of the main presuppositions of modern science – the belief in an intelligible order imposed on nature. The quest for laws of nature was commonly seen in the seventeenth century as a quest to uncover the divine legislation that lay behind nature's regularities. Expressed theologically, it was the constancy of the divine will that upheld the uniformity of nature. Religious beliefs could also provide motivation for scientific activity, though the attempt to determine motivation can be extremely frustrating. The proclamation that the wisdom of God could be discerned in the works of creation featured in popular texts of natural theology and expressed a sense of wonder and awe that was voiced by natural philosophers with religious leanings. If there was sometimes motivation to attack atheism, the sciences could be enlisted for that purpose, as when Robert Boyle argued that it was impossible to study the wonderful world of microscopic life and remain an atheist.

Sanction for scientific activity could also be found in religious doctrines. Francis Bacon insisted on an analogy between the book of God's works and the sacred book of God's words. The duty to study the latter implied a similar duty to study the former. Bacon also argued that experimental methods encouraged the Christian virtue of humility whereas proponents of Aristotelian learning in the universities often arrogantly presumed to know how God *must* have made the world. Bacon is often said to have effected a secularisation of knowledge by separating the domains of science and religion, but his emphasis on the application of scientific knowledge, as in medicine and agricultural reform, was associated with an ethical imperative that reflected his Protestant Christianity. During the seventeenth century, and many times later, empirical methods were justified in terms of the freedom the Creator had enjoyed in creating whatever world 'he' wished. One simply could not know *a priori* the mind of God. It was necessary to examine nature directly in order to establish which of the many possible worlds the Creator might have made had in reality been instantiated. Newton attacked the rationalism of Descartes in this way. His objections indicate other respects in which religious convictions could find expression in scientific contexts. Newton was deeply committed to the unity of nature, a regulative principle that undoubtedly resonated with his strong unitarian theology and which contributed to his confidence that the inverse square law of gravitation was of universal application.

When reflecting on the motions of the planets, Newton also affirmed the importance of aesthetic considerations in the appraisal of scientific theories. He was struck by the fact that all the planets orbited the sun and in almost the same plane – a pleasing arrangement that he ascribed to the aesthetic judgement of the Creator. This is a major respect in which religious beliefs have found expression in the sciences, the assumption being that scientific methods may assist in revealing facets of beauty and elegance in the structure of the world that one would not expect to find if nature simply operated blindly. Copernicus and Kepler famously claimed that a planetary system focussed on the sun revealed hidden harmonies worthy of a Creator that were simply not transparent in a geocentric cosmos. The point was nicely captured by Einstein when he announced that, confronted by a new physical theory, he would always ask himself whether had he been God he would have made the world that way!

These few reflections show the complexity of the relations between religious belief and the sciences in the West. There can certainly be anti-religious motivation for scientific work. During the celebration of the 50th anniversary of the double helix for DNA, Francis Crick reaffirmed not only his hostility towards religious beliefs but also the antireligious motivation for his scientific reductionism. On the other hand, there has been no necessary linkage between science and atheism. The Director of the human genome project, Francis Collins, is well known for his Christian convictions.

6. Can we have a religious science?

The taxonomy I have just outlined shows that the question "can we have a religious science?" is too crude as it stands. The example of Francis Bacon is constructive; because, on one level, he insisted that scientific explanation should not be based on final causes and appeals to divine purposes. But to call his science non-religious would be an error because there were other levels on which he would give a religious rationale for the importance of scientific enquiry. For example, he believed that the application of scientific knowledge would help to restore the dominion over nature that God had originally intended for humankind before it was lost as a consequence of human sin. It is clearly important to distinguish between the content of scientific theory and the motivation for undertaking scientific research. I would consider that claims for a religious science made on the basis of a theoretical content determined by conclusions drawn from a sacred text or from other religious precepts should be viewed with suspicion. I do not find myself sympathetic to claims that a creation 'science' can be deduced from the Bible or from the Qur'an. On the other hand, I would be willing to call the science of a pious practitioner 'religious' if the practice was motivated by religious concerns and undertaken in a spirit of piety, dedication and humility.

7. Can science dispense with religion?

There is clearly a sense in which science, understood as either a body of theory or as a set of practices, can dispense with religion. It usually does. Scientists in secular cultures can get on with the task of research without deference to any religious attitudes or demands. Indeed, since the scientific academies were established in seventeenth-century Europe, it has been a recurring feature of scientific culture to avoid the divisive issues of religion and politics wherever possible. At a deeper level, it may be tempting to suggest that the success of science presupposes certain features of the world (such as the intelligible ordering referred to above). But whereas it may once have been necessary to have a theological underpinning of such features, an empiricist could now retort that belief in the uniformity and continuity of nature has been triumphantly vindicated by the immense number of successes achieved through scientific research. In other words, the justification for the metaphysical belief can now be given in pragmatic rather than theological or religious language. I would nevertheless insist that scientists do not cease to be human when they practise their science. As Thomas Soderqvist has pointed out, a life in science can generate all the existential concerns that one associates with being human. There is no ultimate escape through the sciences from human emotions, passions and needs. One might even suggest that when science becomes a passion, it takes on a certain religious aspect.

8. Can one separate the domains of activity of science and religion completely?

A thesis of complete separation is very attractive as a default position. I am personally drawn to Wittgenstein's conception of different language games with their distinctive grammars and frames of reference. A huge amount of confusion has arisen, and still does arise, from attempts made to fuse scientific and religious concepts together. As St. Augustine recognised in antiquity, to base one's interpretation of a sacred text on the latest secular knowledge was likely to be a profound mistake because as the 'science' moved forward, the meaning given to Scripture would turn out to be embarrassingly obsolete, threatening its authority in other domains. There has, of course, been recurring pressure to reinterpret the precepts of the different religions in ways that reflect the concerns and knowledge of later periods. Without such sensitivity to changing cultural priorities, the messages of religious leaders can begin to sound archaic and irrelevant. It is not clear, however, that to invoke sophisticated modern science in order to give new meanings to religious doctrines is always the best way forward. When

Newton redefined divine attributes through the categories of his natural philosophy, he conferred meanings on them that, through their very precision, became easy targets for sceptical attack. To import concepts of divine providence into one's science, as Newton also did, has usually led to embarrassment. When Laplace was able to give a mathematical account of the self-stabilising properties of the solar system, in contrast to Newton's invocation of providence to ensure that the system did not run down, Laplace could declare that he had no need of the god hypothesis – a remark allegedly made to Napoleon and one that has come to epitomise the way in which scientific progress can lead to religious retreat.

It is therefore possible to sympathise with attempts to separate the magisteria of science and religion, such as that made by the late Stephen J. Gould in his book *Rocks of Ages*. The discovery of facts about the physical world becomes the province of the sciences; discourse about morality is preserved for the religiously inclined. Such distinctions have been made many times in the past, to protect religious discourse as well as to give the sciences the autonomy they need. The problem, however, is that such neat distinctions never quite capture the totality of the scientific or the religious life. There is evidently more to religious discourse in the Christian traditions than references only to moral teaching would embrace. And, as Gould himself noted in his work in the history of science, scientific theory can be shaped by many facets of a cultural context and these would have to include the religious. The historical reality is that there has been cross-traffic in both directions. Volume 16 of *Osiris*, entitled *Science in Theistic Contexts*, which I was privileged to co-edit with Margaret Osler and Jitse Van der Meer, contains a series of instructive case-studies showing how religious commitments have interpenetrated scientific theorising. It is not really surprising that they have done so because scientists with religious, or anti-religious, convictions have found it difficult in practice to completely insulate the dominant interests in their lives, one from the other.

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The Relation of Science: Christian Theology[1]

1. What is your definition of science and of religion?

Authentic science is one particular way of acquiring knowledge, based on testable descriptions of the world obtained through the human interpretation (theoretical science) in natural categories of publicly observable and reproducible sense data (experimental science), obtained by sense interaction with the natural world. General characteristics of authentic science include the importance of presuppositional foundations; the role of science as the revealer of the mechanisms active in the world; the impersonal nature of science in which the scientist is the only person involved, with all the rest being objects of investigation; the ambivalence of science, since science does not automatically solve all of human problems; and the ethical silence of science that limits itself to describing "what is," not "what should be."

Rather than the rather vague word "religion," I prefer to speak of "theology" as the more appropriate counterpart of "science." Then authentic Christian theology is one particular way of acquiring knowledge, based on descriptions of the world obtained through the human interpretation of the Bible (with the guidance of the Holy Spirit) and human experience (interpersonal relationships). Science is the result of human interpretation of God's work in creation, and correspondingly theology is the result of human interpretation of God's revelation in the Bible and personal relationships (see Figure 1 later in this article). Authentic theology is personal, since it is concerned primarily with relationships between human beings and God, between human beings and one another, and with the healing of broken relationships; ambivalent, since theology is essential for a Christian life, but it is not from theology itself but from the experience of God's love, grace, and forgiveness in Christ that the basis and strength for that life proceeds; the basis for ethics, since any system of ethics requires the adoption by faith of a system of values; the foundation for a worldview and a life in relationship with God.

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[1] This article is based on material from *Putting It All Together: Seven Patterns for Relating Science and Christian Faith*, by R. H. Bube, University Press of America, 4720 Boston Way, Lanham, Maryland 20706, USA (1995). All of the questions discussed in this manuscript, together with many others, have been treated in greater detail in this book.

Major points of emphasis in these definitions are as follows. Both authentic science and authentic theology provide *one particular way* of acquiring knowledge; neither provides the only way to acquiring knowledge. The particular way in which science provides its knowledge is intrinsically different from the way in which theology provides its knowledge. Science is by design intrinsically impersonal; theology is by its nature intrinsically interpersonal. Acquiring knowledge in both cases is the result of human interpretation, not of some automatic totally objective process. Science is committed to providing interpretations that involve natural categories of description; if such natural categories are inappropriate for a specific instance, then nothing can be said about it on the basis of science alone.

Common features of authentic science and theology may be summarized as follows. (1) Both science and theology are based on faith commitments: a faith commitment to the intelligibility of the world and the "possibility" of doing science, on the one hand, and a faith commitment to God as most clearly revealed in the life and teachings, death, and resurrection of Jesus Christ on the other. All fundamental human choices start with faith commitments; science and theology are not exceptions. (2) Both science and theology develop descriptions of reality based upon evidence. The evidence that each produces is usually obtained in a different way, but neither establishes conclusions as the result of proof. (3) Descriptions of reality produced by science are able to be tested by human sense interaction with the physical world. Descriptions of reality by theology are able to be tested to some extent by human experience both in historical context and in the present. (4) Both authentic science and authentic Christian theology provide us with partial descriptions of part of reality. Neither provides us with complete or absolute descriptions of reality. But it is important to realize that a partial description may still convey valid insights into reality. Both science and theology provide us with insights into *what reality is like.*

Mention should be made of differences between various branches of what have all come to be called science, in particular the physical sciences (physics, chemistry, geology, biology etc.) and the social sciences (psychology, medicine, political science, sociology, etc.). In practice, the physical sciences can follow a much more complete representation of the definition of authentic science given above, whereas the social sciences frequently involve inputs involving human opinions, beliefs, thoughts, etc. Often the social sciences have separated into two parts, one seeking to follow the impersonal lead of the physical sciences and the safeguards associated with them, and the other recognizing the role of personal relationships and other inputs (e.g., research psychology vs. clinical psychology, medical research vs. practice of medicine, etc.). To claim the same ultimate reliability for the social sciences as for the physical sciences can sometimes be misleading.

2. Do you see any conflict between your definitions of these two concepts?

There can be no ultimate conflict between authentic science and authentic theology, but it is important to emphasize the difference between "ultimate conflict" and apparent disagreements in specific cases. Also the claim that there is no conflict between authentic science and authentic theology is not based upon the compartmentalization of these two areas, so that it is impossible for an apparent disagreement to occur.

Authentic science and authentic theology do interact and provide complementary descriptions of the same reality. Both authentic science and authentic theology give us different kinds of descriptions of what reality is like; neither one ordinarily gives descriptions of what reality is. In an oversimplified way, scientific descriptions generally provide impersonal answers to "how" questions, whereas theological descriptions give personal answers to "why" questions. If we have both scientific and theological descriptions of the same areas of life, then we are called upon to integrate these two descriptions into a more complete description of what reality is like. Instances of apparent disagreement should lead to a re-examination of the interpretation involved in both authentic science, and authentic theology, and to search for how the two types of interpretations can be integrated in a way that is faithful to them both.

3. Where do you think there may be a conflict between these two?

Authentic science is to be differentiated from pseudoscience, which makes claims similar to those of authentic science, but is either (1) simply bad science (e.g., neglects important variables), (2) an attempt to do something that science cannot do (e.g., provide the basis for ethical values), or (3) an attempt to do scientific activity designed to support some previously accepted philosophical, metaphysical, religious or political ideology.

There is a parallel between pseudoscience and pseudotheology. Pseudotheology may be either (1) simply bad theology (e.g., ignores the principles of hermeneutics in biblical interpretation), (2) an attempt to do something that authentic theology cannot do (e.g., provide the basis for scientific mechanisms), or (3) an attempt to use theology in the effort to establish or justify a particular philosophical or religious ideology.

Conflicts that appear to occur between science and theology are often the result of attempts to include descriptions involving science and pseudotheology, pseudoscience and theology, or pseudoscience and pseudotheology.

4. What have been the grounds for the development of conflict between these two?

Two well-know examples of such a conflict are the result of the identification at a particular time of the currently accepted theological description and scientific description as finally established. It turns out that this may well be a combination of bad science with bad theology.

In the case of Galileo, it had been assumed that previous scientific models of a stationary earth with the sun revolving around it had a unique agreement with the theological descriptions of the centrality of earth's importance in human relationships with one another and with God. New scientific evidence that this was not the case was interpreted as a denial of the traditional theological description that had been identified with traditional science. It was only when it was realized that the actual theological description was not uniquely related to the traditional scientific description that the appearance of conflict could be removed.

In the case of Darwin, it had been assumed that the traditional theological description involving instantaneous fiat creation in six days on a young earth was scientifically supported without any serious scientific evidence to the contrary. New scientific evidence that the earth is much older and that a process of evolution could be invoked to describe the development over time of living creatures on the earth, was interpreted as a denial of the traditional theological and scientific descriptions. It was only when it was realized that the actual theological description was not uniquely related to the traditional theological and scientific descriptions that the appearance of conflict could be removed.

It is always important to realize that some questions may need to remain at any particular time simply "open questions." If an interpretation derived from authentic science appears to be in conflict with an interpretation derived from authentic theology, it may be necessary simply to leave the final resolution of the issue open without forsaking the valid insights that we do have from authentic science and authentic theology. There are, of course, several possibilities: (1) our scientific interpretation may be incorrect or incomplete; (2) our theological interpretation may be incorrect or incomplete, (3) both our scientific and our theological interpretations may be incorrect or incomplete, or (4) both scientific and theological interpretations may supply us with valid insights into the resolution of the problem without giving us the detailed descriptions needed to simply consider the issue closed forever.

5. What has been the role of religion in the development of science in the West?

A major contribution of theology to the development of science in the West is found in the biblical teaching on Creation. The doctrine of creation identifies the universe and everything in it as the work of God, as something made by Him. As a consequence, it is a good and proper activity to attempt to understand this work of God in an orderly way, not to assume that God must have done what God could do, but to attempt to find out what God did by investigation of what He has done.

This knowledge is good in itself, "thinking God's thoughts after Him", and it is also essential for the fulfillment of the human role of caretakers of the creation. The understanding of the world as the work of God effectively desacralizes it, i.e., the objects in this world are regarded and respected as objects made by God, not as spiritual entities in themselves as in animism. The biblical concept of stewardship expresses our responsibility for the care of all things in the created universe that God has given into our trust: human beings, living creatures, land, water, air, energy, and natural resources. Both knowledge and commitment are required for the fulfillment of this stewardship, and science has been one of the ways in which the needed knowledge has been sought.

6. Can we have a religious science?

The answer to this question depends critically on what it actually means. If, for example, it means "Can religious people do good science?", the answer is obviously "Yes". If it means "Can we treat our theological approach to developing a worldview in exactly the same way as we treat our scientific approach?", the answer is "No". If it means "Can our religion be an important factor in what kind of science we do?", the answer is "Yes". If it means, "Can we introduce religious concepts into our description of authentic scientific mechanisms?", the answer is "No".

Usually, however, it means something else; it is a call for what has also been called "theistic science". The insistence in our definition of authentic science that scientific descriptions must by definition be given in natural categories, seems to some to improperly exclude God from the scientific description of the physical world. They do not think that God's creation and sustaining of the natural world can be upheld as long as God's actions are not included as being appropriate mechanisms for a scientific description. The attempt to include direct divine action in the categories used in scientific descriptions, however, inevitably leads to a return to the faulty position involving a God-of-the-Gaps. In this position, the evidence for the existence and activity of God is found primarily in those regions of human ignorance, those gaps in human understanding, where descriptions in terms of natural categories have not been possible, i.e., evidence for God from the natural world is separated from evidence for God from His supernatural activity, only the latter being accepted. The unfortunate paradoxical result is that as more and more is known about God's natural activity, the less and less evidence there is for the existence of God!

The advocate of theistic science claims that unless God is admitted as a direct agent in scientific theories, then this is equivalent to saying that God cannot act as a primary cause directly. This is not true. In a case in which God acted directly as a primary cause, the pursuit of authentic science would lead to the conclusion that no scientific description is possible. It would then be appropriate to propose other possible situations such as the direct action of God as a primary cause.

7. Can science dispense with religion?

Since we have defined authentic science as being concerned with descriptions in natural categories, it might seem that a simple answer to this question would be "Yes". But that would be to forget that human life encompasses much more than is adequately described by science. Science as a strictly defined discipline might well exist unchanged without theology, but scientists as human beings could not. There are basic effects of religious commitment that extend beyond simply invoking acts of God as scientific mechanisms.

The biblical revelation provides insight into human nature. It raises the much needed warning against the supposedly unprejudiced objective conclusions of scientists. It provides the basis for human dignity and worth essential for determining how human beings are to be treated scientifically. It provides the guidelines to decide what kinds of scientific activities are to be given high priority and which are to be discouraged as much as possible. And it forms the foundation for dealing with the great number of ethical problems that modern science is encountering with ever greater frequency.

8. Can one separate the domains of activity of science and religion completely?

Once again, the answer to this question is either "Yes", if we focus on the actual operating practices of science and theology, or "No", if we focus on the fact that both authentic science and authentic theology provide valid insights into the nature of all of reality – the same reality for them both.

The main difference between science and theology is the kind of knowledge that each gives. These are illustrated in Figure 1 in an overly simplified way. Science primarily answers questions about "how" something happens, what mechanisms are acting in the universe for it to happen, and what are proximate natural causes for it. Theology primarily answers questions about "why" something happens, what the purpose and meaning of the events are, and what the ultimate causes for it are. Science can tell us to a degree what is happening, and what something is like, but only theology can provide us with the basis for the discernment of the meaning of a particular event, or with a standard against which to measure values and ethical imperatives.

The representation given in Figure 1 should not be interpreted as indicating some kind of complete and simplistic separation between science and Christian theology, so that scientific interpretation of the world never affects Christian theology, or that interpretation of the Bible and experience never affects science. Scientific descriptions may be influenced by inputs from God's revelation in the Bible, and choices of scientific problems for research and development certainly will be influenced by a scientist's theological convictions. Some theological descriptions are influenced by inputs from God's work in creation that guide us in understanding the majesty of God and in interpreting Bible in terms of relevant physical models.

Science can provide us with information about the things that make up a person and the sociological characteristics of human society, but theology reveals to us the nature of interpersonal relationships and our relationship with God. Science establishes as wide a gap as possible between the observer and the observed, whereas theology deals with the realm of human experience in which we enter into relationships with other persons, making ourselves vulnerable in the process.

The viewpoints of science and theology represented in Figure 1 are most helpfully seen as being complementary descriptions. Science and theology tell us different kinds of things about the same things. Each, when true to its own authentic capabilities, provides us with valid insights into the nature of reality from different perspectives. It is the task of individuals and communities of individuals to integrate these two types of insight to obtain an adequate and coherent view of reality.

The giving of complementary descriptions of the same reality is often a simple matter of necessity. It is neither a case of separating science and theology completely so that no interaction is possible, concluding that science and theology are mutually exclusive, or accepting contradiction. The integration of complementary descriptions to obtain a more complete description of the same whole often occurs for two basic reasons: (1) limitations imposed by the necessity of using categories from the realm of the known to describe new concepts in the realm of the unknown, and (2) limitations imposed by the use of descriptions drawn from different realms of discourse, as is the case when complementary scientific and theological descriptions of the same area are involved. Ethical issues concerned with human life, for example, must be informed by insights drawn from the biological and psychological scientific areas, and from insights provided by biblical perspectives on human personhood.

Figure 1

GOD

		Creates		speaks
Givens:		natural world		the Word of God: the Bible
Method:		human interpretation via scientific method		human interpretation via biblical hermeneutics
		scientific description		theological description
	to know	understand	to relate	understand
		theoretical		theoretical
		human curiosity		human quest
	to make	control	to serve	service
		technological		living
		human responsibility		human call
		THINGS		PERSONS
		mechanism		meaning
		probability		purpose
		what? how?		why?
		I-It		I-Thou
		evolution		creation
		chance		providence
		body		soul
		brain		mind
		animal		human being
		machine		creation of God
		temporal		eternal
		physical		spiritual
		Secular		sacred
		survival		salvation

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1. What is your definition of science and of religion?

Science has been notoriously difficult to define (twentieth century philosophers of science such as Popper and Kuhn have attempted various definitions based on verification, falsification and paradigm shifts). But a straightforward and workable definition would be that science is a methodical search for knowledge and a deeper level of understanding about the physical and biological world.

Religion is a way of life and a philosophy of life based on the fundamental belief that the universe has a Creator who is intimately aware of its day to day operations and sustains it through His omnipotence and omniscience.

2. Do you see any conflict between your definitions of these two concepts?

None at all. The human mind is capable of investigating the laws which govern the operations of the physical and biological world. There appears to be a deep connection between the human mind and what is happening out there in the cosmos (what we theorize as scientists often turns out to be true upon subsequent experimentation). Science provides the mechanism (physical explanations) and religion the meaning and purpose of human existence.

3. Where do you think there may be a conflict between these two?

Where the concept of religion becomes so narrow that God is progressively eliminated from the universal equation. In deist theology, for example, God created the universe but then retired as He was no longer required to explain previously inexplicable phenomena such as thunder and lightning. Agnosticism and atheism then set in taking science and religion on a collision course (as we have seen in the Western world in the nineteenth and twentieth centuries).

4. What have been the grounds for the development of conflict between these two?

To some extent, this is answered above. Religion (being holistic) takes more account of science than science does of religion. But if as a result of the developing intellectual atmosphere of scepticism, cynicism, atheism and agnosticism, science is paraded as the new basis for human morality then there is bound to be conflict between the two. As long as some intellectuals in human society maintain that science can ultimately explain everything (the human mind and creation of the universe included), then there will be self-perpetuating conflict as a result of this deeply mistaken intellectual radicalism.

5. What has been the role of religion in the development of science in the West?

The role was positive at one time inspiring scientists like Newton (seventeenth century) in their scientific endeavours. The 'parson naturalist' is a well known occupation of the time, science being used to glorify the Creator. However, relations between institutionalized Christianity and the scientific establishment soured later on. Christianity became an impediment to the development of scientific thought as the Christian Fathers perceived there was too much incongruence between what the scientists were saying and what the holy scripture professed. Biblical literalism now stood on its head.

6. Can we have a religious science?

I have already said that religion, being holistic, takes more account of science than science does of religion – so yes. We can use a multimeter to measure the light intensity of a rainbow but we can not (using the same methodology) explain its beauty. A religious science would have a different paradigmatic framework – it would be based on absolute belief in God as the Creator and moment-by-moment Sustainer of the universe, and on our redefined position as His responsible stewards. Such a perception has far-reaching (but constructive) consequences for humanity.

7. Can science dispense with religion?

To a large extent, science in the Western world has dispensed with religion – the painfully destructive consequences manifesting themselves in the form of environment degradation, excessive commercialisation of science by multinational companies and ill-judged interference in the biological world without adequate forethought of consequences, are there for all to see.

8. Can one separate the domains of activity of science and religion completely?

Again, the Western world (blindly followed by much of the Muslim world) has attempted to separate the two domains. But this is an artificial separation, existing in the mind only. There is a fundamental moral vacuum at the heart of Western society whose place cannot be filled by science. Religion will always be required to make good this deficiency. Separating the domains results in intellectual anarchy and moral confusion – we are witnesses to such a perversity.

Prof. John Byl

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Post-Doctoral Professional Experience: Faculty positions at University of British Columbia and Dordt College (Iowa, U.S.A.). Since 1978 at Trinity Western University (Langley, B.C., Canada); Professor (since 1986) and Chair (since 1980) of the Department of Mathematical Sciences. Emeritus Professor of Mathematics of Trinity Western University (since 2009).

Publications: Two dozen scientific papers in astronomy, mathematics and physics; two dozen papers on science/religion issues. Books: *God and Cosmos* (2001) and *The Divine Challenge: Linking Matter, Mind and Mathematics* (in Dutch 2003, English edition in press).

1. What is your definition of science and of religion?

(a) Science

Science can be defined as the systematic study of the natural world. Such study is grounded in detailed experiments and observations of natural processes. These are then analyzed for patterns, regularities and laws. However, science involves much more than empirical observation and mathematical analysis. Science has also a large, more speculative, theoretical component. For example, scientists want to *extrapolate* beyond their rather limited set of observational data, in order to draw more general conclusions about the universe. This requires various assumptions about the nature of the universe. A common conjecture is that of the *uniformity* of nature; the physical laws and processes observed here and now are assumed to apply universally. Some of the sciences (e.g., cosmology, geology and evolutionary biology) depend strongly upon significant extrapolations of presently observed data back to the distant past. Furthermore, scientists seek also to *explain* reality. Particular events are explained in terms of physical laws; the physical laws themselves are explained in terms of more fundamental physical concepts and principles, and so on.

The basic, observational aspect of science I shall refer to as *science1*; the theoretical extrapolation and explanation of these observations I shall denote as *science2*.

(b) Religion

Religion can be defined in various ways. Broadly, it can refer to any set of beliefs, values and practices that form a worldview. A worldview system will include beliefs about ultimate reality, epistemology, ontology, ethics, purpose, and so on. Everyone has a worldview, although many people have not explicitly formulated their worldview. I shall call religion in this broad sense *religion1*.

One currently popular form of religion1 is *naturalism*. It strives to interpret all of reality in terms of purely natural processes and entities. As such, it almost always incorporates an evolutionary process wherein everything in the universe – even man – is assumed to have evolved from primitive, purposeless matter/energy. Consequently, man is viewed as a complex machine that ceases to exist once his material body dies. Rational norms and ethical standards are considered to be mere human inventions, having no objective authority.

Naturalism often embraces a materialist metaphysics coupled with an empiricist epistemology. Materialist reductionism is particularly common among scientists. For example, Edward Wilson (*Consilience: The Unity of Knowledge*, 1998) believes that all truth can ultimately be acquired through the reductionist methods of natural science. Wilson argues that all our knowledge, as well as our appreciation of beauty and perception of right and wrong, can in principle be reduced to the laws of physics. Likewise, Francis Crick (*The Astonishing Hypothesis*, 1994) asserts that all our beliefs even our sense of personal identity, purpose and free will – are mere illusions caused by our brain neurons. Such reductionism stresses the objective, physical realm at the expense of virtually emptying our subjective experiences of any genuine content.

More narrowly, religion is generally taken to mean the belief in and worship of God. In this sense, religion refers to a specific worldview that affirms the existence of a supernatural being. Often it includes some form of divine revelation. Such revealed knowledge may form the basis of ethical values, knowledge of origins and eschatology, and so on. I shall call such supernatural religion *religion2*.

The specific form of religion2 that I shall be defending here is *theism* as formulated in traditional Christianity. Central to the Christian worldview is the notion of a sovereign, all-knowing, tri-personal God, Who has revealed Himself through the Bible. This God is the creator of everything, including logical and moral absolutes. Everything that happens unfolds in accordance with God's eternal plan. In this divine plan, man, who was created in God's image, plays a major role serving and glorifying God. Man was created good but, through his own choice, fell into sin. Through God's grace in Jesus Christ, some are redeemed. After physical death, our soul lives on, to be reunited with a renewed body on the Day of Judgment. Thereafter we receive our eternal reward.

2. Do you see any conflict between your definitions of these two concepts?

There is no conflict between these definitions.

Much of the perceived conflict between science and religion is due to the erroneous belief that science has no need of any metaphysical or epistemological assumptions. It is widely believed that science is factual, rational and objective, whereas religion is mythical, irrational and subjective.

This myth of scientific neutrality fails to properly distinguish between observational facts and theoretical speculations. It overlooks the highly subjective aspects of science. We note, first, that the same data can be explained by many different theories. For example, galactic red-shifts can be explained in terms of the expansion of space, motion through space, gravitational red-shifts, "tired light", and so on. As noted by Karl Popper, Thomas Kuhn and others, scientific theories are not simply derived from data. Rather, the construction of theories involves a large dose of creativity. Second, the same mathematical equations can often be interpreted in many different ways. Consider, for example, the various different interpretations of quantum mechanics (e.g., Bohr's positivism, Bohm's neo-realism, the many-worlds view, etc.). Third, assessing the veracity of competing theories involves the subjective application of subjective criteria for theory selection. We may prefer theories that are simple or beautiful but why should simple or beautiful theories be more likely to be true? Ultimately, we construct and choose theories that best reflect our basic beliefs about the nature of the world.

Every scientist has a worldview and the science that he does will inevitably be informed by that worldview. This is particularly so regarding the theorizing of science2. By comparison, science1, being at the level of observational data, is relatively objective. Yet, even our choice of what and how we choose to observe depends on our worldview.

In short, science is by no means worldview neutral. What is widely perceived as a conflict between science and religion is in actuality usually a clash between two opposing worldviews, generally naturalism versus theism.

3.Where do you think there may be a conflict between these two?

Conflicts involving science and religion can occur in the extrapolation, explanation and application of observational data.

A prime issue is that of epistemology. What can we know? In opposition to *empiricism*, which asserts that the only valid knowledge is sense data, Christianity asserts that God has revealed truth in the Bible. Christianity embraces the Bible as a trustworthy source of knowledge about God, history, the spiritual realm, moral standards, origins and eschatology. Hence, a Christian epistemology will acknowledge Biblical data in addition to sense data and logic.

Conflicts can involve also ontological questions regarding the ultimate nature of reality. For example, in opposition to *materialism*, Christianity takes God, a spirit, as the ultimate reality. Christianity takes the physical universe to be a creation of God and, as such, a mere subspace of a much richer reality that contains both matter and spirit.

Further conflicts can involve causation. For example, in opposition to *naturalism*, which admits only natural causes, Christianity affirms the existence of spiritual forces that interact with the physical universe. The universe, created by the word of God, relies upon God to sustain it in its continued existence. Normally, God lets the universe unfold according to the properties He as assigned to it. However, God is not bound by the natural laws that He has set. These are merely the regular manifestations of His will. God may sometimes act more directly, through His spiritual agents (e.g., angels) or miracles. Hence, some natural events may have direct supernatural causes. In particular, God acts directly through the incarnation, resurrection and ultimate return of Jesus Christ.

Moreover, in opposition to the notion that some things (e.g., in quantum mechanics) happen by chance (i.e., without being fully caused), Christianity maintains the full sovereignty of God. God is the primary cause of everything. Everything that happens, happens in accordance with God's all-encompassing plan. Everything happens for a sufficient reason, given by God's purpose.

Such conflicts, to the extent that they involve science, concern primarily science2. At issue, are generally not the *observational* data but only their *theoretical* extrapolation and interpretation. It is often not even specific theories (e.g., general relativity, quantum mechanics, etc.) that are controversial but, rather, their philosophical interpretation.

4. What have been the grounds for the development of conflict between these two?

In the popular mind, the two greatest historical conflicts between science and religion have been those involving Galileo and Darwin.

The Galileo affair, in the early 17th century, was a complex dispute, inflamed by politics and personalities. It was primarily a family squabble within Christianity. Two different scientific research programs clashed, each program supported by its own group of Christian scientists. The central issue was the epistemological question of how to determine absolute motion. Should the absolute frame of reference be set by Biblical standards, by Aristotelian philosophy, by mathematical simplicity, or by other considerations? The difficulty was that the observational data in themselves can yield information only about *relative* motion. The question of *absolute* motion must thus be settled by extra-scientific definitions and considerations. As it is now widely recognized, the resolution of this issue depends largely on one's worldview assumptions.

The conflict precipitated by Darwin concerns primarily origins. How did life, in all its manifold forms, come to be? The dispute is not so much about *observations* of living things, fossils, geological formations, etc., but how to *explain* how they came to be. As such, the conflict involves questions concerning the ultimate nature of reality (e.g., can mind be explained entirely in terms of matter?), eschatology (e.g., does man have a non-material soul that survives physical death?), and causation (e.g., does the origin of life require special divine acts?). Again, a central issue is one of epistemology: what role should divine revelation (e.g., the Bible) play in interpreting the results of observational science1, in choosing the theories of science2, and in informing our view of origins, etc? Here, too, it is clear that this conflict is rooted in a clash of opposing extra-scientific presuppositions.

5. What has been the role of religion in the development of science in the West?

In the West, Christianity played a large role in the development of science. Copernicus, Kepler, Galileo, Boyle, Newton and many other founders of science were devout believers in the Biblical God. Their science was constructed within the framework of a Christian worldview.

Various factors in the Christian worldview encouraged the development of science:

1. The Biblical conception of an omniscient and omnipotent personal God, Who made everything in accordance with a rational plan and purpose, contributed to the notion of a rationally structured creation.
2. The notion of a transcendent God, Who exists separate from His creation, served to counter the notion that the physical world, or any part of it, is sacred. Since the entire physical world is a mere creation, it was thus a fit object of study and transformation.
3. Since man was made in the image of God (Gen.1:26), which included rationality and creativity, it was deemed possible that man could discern the

rational structure of the physical universe that God had made.

4. The cultural mandate, which appointed man to be God's steward over creation (Gen. 1:28), provided the motivation for studying nature and for applying that study towards practical ends, at the same time glorifying God for His wisdom and goodness.

6. Can we have a religious science?

We have already noted the subjectivity and epistemic limitations of science2. Since science2 must necessarily be based on extra-scientific values and presuppositions, all science2 is inevitably driven by one's worldview assumptions. Hence, science certainly can – and indeed *must* – be religious in the broad sense of religion1.

Can science be religious in the stricter sense of religion2? It is evident that only on the basis of metaphysical assumption can one rule out the possible existence of a spiritual realm, of supernatural causation and of a reliable divine revelation. It follows that it *is* possible to have a science operating within the framework of a Christian worldview, with all the metaphysical, epistemological and ethical implications that this entails. For example, religion2 might insist that an additional criterion for theory selection be that of conformity with divine revelation (e.g., the Bible). Religion2 can further serve as a moral guide, helping one to prioritize and select research projects. Science informed by religion2 would impact particularly questions of ontology, origins, applications and eschatology.

7. Can science dispense with religion?

Science certainly cannot dispense with religion1. As we have already noted, extra-scientific presuppositions are essential for choosing research projects, selecting theories and interpreting the results.

Can science dispense with religion in the narrower sense? Does science need God?

Naturalists believe not. It has, however, become clear that naturalism falls short in providing a coherent worldview framework for science. For example, naturalism has offered no plausible explanation for the mathematical structure of physical reality, for the existence of a rational, causally effective human mind, or for the existence of absolute moral or rational norms. Indeed, materialism, an essential part of most forms of naturalism, denies the very existence of non-physical entities such as minds and norms. Even if such non-physical entities did conceivably exist, the naturalists' empiricism affords him no means of gaining access to them.

Naturalism is fatally plagued by a defective metaphysics and epistemology that have no room for moral or aesthetic values, truth, purpose, meaning, love, goodness or beauty. Naturalism is a truncated worldview that has no place for precisely those aspects of man that make him human.

By undermining the reality of a purposeful self and the possibility of objective knowledge, naturalism undermines itself. To *rationally* defend materialism, one must necessarily presume the existence of rational minds and absolute norms. Since materialism rejects such *non*-material entities, it follows that the rational defianse of materialism is self-refuting. The same holds for empiricism. The empiricist's assertion – that only sense data are valid sources of knowledge – is itself *non*-empirical. Hence empiricism, too, is self-refuting. Given these lethal flaws in materialism and empiricism, it is not surprising that naturalism has led to post-modern skepticism.

Any viable worldview must embrace an adequate epistemology that can transcend the stream of mere empirical data. It must include also an adequate metaphysics that has room for rational minds and absolute universals. A viable worldview must be able to account for science and common sense. For example, any scientist must assume that the universe has a law-like structure that is comprehensible to humans.

Theism, unlike naturalism or skepticism, provides a sufficiently rich metaphysics and epistemology that can credibly explain the full range of reality, including particularly the nature and condition of humanity. Theism can readily account for the rationality of the universe and our ability to function as scientists.

In short, a scientist may profess to be an atheist, but he can do his science only on the borrowed premises of an essentially theistic worldview.

8. Can one separate the domains of activity of science and religion completely?

No. As we have seen, science can function only within the parameters of a theistic worldview. Religion2 is needed to provide a sound metaphysical basis for science, to guide its research programs and theory selection, to interpret its conclusions, and to make ethical applications. Science, on the other hand, can help us in our religious quest to serve God as His earthly stewards, applying scientific knowledge for the benefit of man and the glory of God.

Prof. Philip Clayton

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Books: *God and Gravity: A Philip Clayton Reader on Science and Theology,* ed. Bradford McCall (Eugene, OR: Wipf and Stock, 2018), *The Predicament of Belief: Science, Philosophy, Faith,* with Steven Knapp (Oxford: Oxford Univ. Press, 2011); *Adventures in the Spirit: God, World, Divine Action* (Minneapolis: Fortress Press, 2008)‘ *Mind and Emergence: From Quantum to Consciousness* (Oxford: Oxford University Press, 2004); *God and Contemporary Science* (Edinburgh: Edinburgh University Press and Grand Rapids: Eerdmans, 1998); *Explanation from Physics to Theology: An Essay in Rationality and Religion* (New Haven: Yale University Press, 1989).

1. What is your definition of science and of religion?

Religion is the human response to the Divine as it reveals itself to humanity. It follows immediately that religious beliefs are inherently matters of dispute. Religious truth claims (on this definition) must be controversial to those who are not religious, since they do not believe that there *is* a Divine that has revealed itself to humanity. But the definition also helps explain dissent among religious traditions, since they differ on whether "he", "she" or "it" is revealed and on what the content of this revelation is. When one concentrates on the differences between these accounts, one will speak of the *religions* of humanity; when one focuses on the one Divine Source for all the world's different religious responses, then one will tend to emphasize the unity of religion.

Science is the disciplined empirical inquiry into the causes of phenomena in the natural world. Science in this sense represents the most rigorous body of knowledge that humanity has ever achieved. Yet, the predictive accuracy of science is bought with a price. The only claims that science can consider are those that are fully criticizable, that is, replicable by any group of researchers anywhere in the world; claims that cannot be so tested fall under the category of metaphysics or the interpretation of science. This requirement of full intersubjective testability is responsible for most of the defining features of scientific practice. Scientific theories must explain any complex phenomenon in terms of its constituent parts; they must appeal to universal laws such that, knowing the laws and the prior state of affairs, one could predict future outcomes; and they must remain permanently open to revision based on new data or new experiments.

2. Do you see any conflict between your definitions of these two concepts?

The initial impression one gets from the definitions is of widely differing attitudes and subject matters. "To be scientific" and "to be religious" initially appear as two vastly different activities and orientations.

Perhaps the most important breakthrough in 20th-century philosophy of science was the recognition that the well-known differences do not constitute a dichotomy: science is more "religious", and religion can be more like science, than was previously thought. For example, science is not value-free; it too is influenced by institutions and paradigms; and what you take the data to be depends, at least in part, on what theory you hold. Conversely, religious believers can be rational and self-critical; they can entertain doubts and consider objections without ceasing to be religious; and they can create accounts of the world no less sophisticated and critical than the accounts provided by scientists. The similarities between the two are further increased when one compares science with *theology*, which is the critical systematic reflection on the beliefs of a religious tradition. In principle, theologians can advance their theories with the same critical attitude and openness to revision for which we praise scientists.

3. Where do you think there may be a conflict between these two?

In the long run – or: in the end – I do not think that there will be a conflict between religion and science. If my belief in God as the Creator of the world, the One who is directing it toward its final consummation, is true, then the laws that govern the world can not be incompatible with the One who created them all.

But look at the word "if" that begins the previous sentence. Is the claim following the "if" true? I *hope* that it's true, and I have *faith* that it's true. But do I *know* that it's true? I may have inner subjective certainty about it, and such certainty often passes as knowledge. In fact, however, it's unlikely that *all* of my religious beliefs are true. For example, it's possible that there are conflicts between certain of my religious beliefs and the facts about the world that science will finally establish. And I could be more wrong than I realize. I believe, for instance, that humans are free and morally responsible before God, but it's possible that human behavior is determined. I believe that God guides the process of evolution in some ways, but it's possible that evolution is utterly random. I believe that reasons sometimes influence my thoughts, but it's possible that all of my thoughts are exclusively the result of the electro-chemical processes in my brain.

Some religious believers think that faith would be compromised – and maybe even God would be compromised – if one concedes that such conflicts are possible. I disagree. I have faith in the consistency of science with my religious belief, but only time will tell whether I am right. Knowing that I may be wrong in some of my religious beliefs adds a dimension of humility to my religious practice. It also makes one more humble when he encounters religious believers from other traditions, deeply spiritual people who believe different things about God and God's actions in history. Yet, shouldn't we be humble where we differ from our fellow religionists, since it's just as possible that I may be mistaken as that they might be?

4. What have been the grounds for the development of conflict between these two?

I mention just four. First, scientists have often extrapolated beyond the conclusions warranted by the empirical data, substituting philosophical theories for justified scientific inferences. When the early Darwinians suggested that human society should be set up according to the "survival of the fittest" principle of evolutionary biology, such that (for example) sick children should be euthanized, they passed off an ethical judgment of their own as if it were a scientific conclusion. Second, religious believers have sometimes confused contingent historical and factual claims made within their traditions with the core, irreplaceable religious content of those traditions. Thus the Catholic church censored Galileo for teaching that the earth might orbit the sun, believing (falsely) that the then-current cosmological model was a necessary tenet of the Catholic faith. Third, both sides have let their interpretation of religion-science relations be colored by inaccurate models. Thus both scientists and believers have in the past assumed a "conflict" or "warfare" model of the relationship. Little wonder then that, having assumed the conflict from the outset, people thought they found examples of conflict wherever they looked! Fourth, the state of science at certain moments of history, and the state of religious thought at those moments, have in fact created situations in which genuine conflicts existed. Physics from (roughly Newton to the 20th century) *was* in conflict with theism; Darwinism until the development of non-deterministic "emergentist" models was in conflict with theism; and the dominant attitude within the neurosciences today is in conflict with theism. Again, however, the stance of faith – the hope on which I wager my life's orientation – is that all such conflicts are temporary, not permanent.

5. What has been the role of religion in the development of science in the West?

Other authors in this book have already explored the many ways in which religion has made positive contributions to the development of science.

Some have argued that, without the belief in God, science as we know it could never have developed.

Thankfully, recent years have seen the development of a new specialized discipline, the history of science-religion interactions. Important new work is being carried out on the history of these interactions in the West, and excellent scholarship is now available on the growth of science within Islamic civilization. (One also notes the recent explosion of interest in the contribution of the Indic traditions to the development of science.) Regarding the Western context, one thinks, for example, of the many publications by John Hedley Brooke, Ronald Numbers, and David Lindberg, among others. This spate of recent scholarship has led to a very nuanced understanding of religion's contribution to the growth of science. Given the data, one cannot maintain that the role of religion has been uniformly positive for science, but neither can one conclude – as was once held – that religion has always served as the enemy of science, inhibiting its progress.

6. Can we have a religious science?

This is a wonderful question because it allows us to differentiate four different aspects of the relationship between science and religion:

- Does the pursuit of science belong to any specific religious tradition, or to religion as a whole? Clearly not: scientific activity represents a dispassionate quest for accurate knowledge of the physical world. Such knowledge, in and of itself, is not at the outset either religious or anti-religious. At the fundamental level, then, science is neutral on the topic of religion.

Can science however be *used* for religious or other purposes? Most certainly. Unfortunately, some of the least attractive episodes in the history of science have involved science being co-opted to serve a religious or anti-religious agenda. One thinks of the embarrassing Lysenko affair in the former Soviet Republic, in which biology was used to support the Communist agenda.

Does science sometimes have implications, direct or indirect, for religious questions? Most definitely! (We return to this topic in the final question below.)

Can science be pursued with a religious mindset, or with religious motivations, or by religious persons as an act of obedience to the Divine? Yes; thankfully the days are gone when people assumed that only the non- or anti- religious person could do world-class science. There are beautiful accounts by Nobel-winning scientists of how their faith and observance as a Muslim, Jew, Christian or Hindu aided and supported their work as scientists. The 120 members of the international project "Science and the Spiritual Quest" or "SSQ" (of which the editor of this book was a member) have given frequent and moving testimonies to the deep contributions which their spiritual and religious lives have made to their doing of science. I recommend to the reader the two SSQ collections of scientists' writings published to date, *Faith in Science* and *Science and the Spiritual Quest: New Essays by Leading Scientists*, both edited by W. Mark Richardson *et al.*

7. Can science dispense with religion?

Here we encounter one of those questions where the answer can only be Yes and No; the hard part is not to give the answer but to understand the different perspectives which yield the dual response.

Yes: it's basic to the scientific method that scientific theories do not need to appeal to religion for their validity. There would be no science if the results of physics experiments turned out differently for Hindus, Muslims, and Christians. Every scientist knows the experience of meeting people from vastly different cultures, languages and religions and yet finding himself in complete agreement with them about the core theories and results of their shared field of science. Such an ability to abstract from religious and other personal differences is part of the methodology that makes science successful in its sphere, and religious believers should not be disturbed by this fact.

But No: if we are ultimately to understand the results of science, we can never dispense with the religious question. Science is not self-interpreting. In order to understand its own results, it is inevitably constrained to draw on broader philosophical resources. Science gave rise to metaphysical questions for Aristotle; it has continued to do so for every great student of science through the ages and up to the present day. Some, though not all, of these metaphysical questions are religious questions: What preceded the Big Bang? What will follow the end of this entire physical order? Is it true, as Steven

Weinberg so famously asserted, that "the more the universe appears comprehensible, the more it also appears pointless"? Or are the "intimations of transcendence" (Peter Berger) within the universe pointers toward a divine source?

8. Can one separate the domains of activity of science and religion completely?

This question arises beautifully out of the previous one. I can only conclude this short essay with a religious response: Science can dispense with religion for a season. In fact, one of the great achievements of the human spirit is its ability to make this abstraction, to study the empirical world in and for itself, apart from the context of ultimate questions. It is a magnificent monument that humans have been able to build by making this separation. Indeed, perhaps ironically, the monument of science is a powerful testimony to what it means for humanity to be created in the image of God.

In the end, though, the study of science leads invariably back to religious questions. We ask, "What is this universe we have come to understand? Why is it as beautiful, as rational, as well-ordered as it is? What is the place of humanity, of me or you, in this vast order? Given all that we know about the cosmos, can one in the end believe that human existence – can I believe that *my* existence – is meaningful?"

Science eventually poses existential questions, just as interpreting its results raises philosophical questions. Gradually, one follows the lines of interpretation further and further – from specific interpretations of concrete theories, to broad interpretations of (say) physics as a whole, to the interpretation of "the nature of nature", and ultimately to the deepest metaphysical question: Why is there something rather than nothing at all? Imperceptibly, one finds himself sliding over into questions whose religious significance is indisputable. In the end, the walls that made science possible in the first place, gradually collapse, and one finds oneself confronted again with the ultimate religious question – the question of the Divine and its self-revelation in the world. In the beautiful words of T. S. Eliot in *Little Gidding.*

We shall not cease from exploration And the end of all our exploring

Will be to arrive where we started and know the place for the first time.

Prof. Reza Davari Ardakani

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Postgraduate Experience: Assistant Professor of Philosophy (1966), Associate Professor of Philosophy (1970); Professor of Philosophy (1982); Tehran University; President, Academy of Sciences, Islamic Republic of Iran.

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1. What is your definition of science and of religion?

The question implies that science and religion cannot be defined with proximate genus and specific difference. How could we, who are dependent on religion and surrounded by the world of science, define the perimeters of science and religion? Naturally, we provide a description of science and religion. Some of the contemporary researchers are of the opinion that our understanding and comprehension is a function of the world in which we live, and that this world has paradigms and measures which guide science. I do not mean we do not know science and religion. Understanding is one thing and describing is something else. Of course, if we are able to describe something, undoubtedly we know it. But, first, we do not know everything through descriptions. Second, the highest form of knowledge is about things that cannot be described such as God, truth and justice. But there are people who are aware of God and those are supporters of truth and justice. Any man of religion is familiar with religion. Any man of science is dealing with science. But neither the man of religion nor the man of science know all of religion or science, and, hence, they are unable to define science or religion (and of course, if they are not philosophers, they would not even decide to define science and religion). This difficulty arises more often in the case of religion, because science is related to reason. But reason is not able to understand the depth and mystery of religion, even though religion itself is not alien to reason. It is clear that here we are not referring to science in its wider sense. What is meant here is a science through which the modern world has been distinguished from other worlds, and its precise example is found in mathematical physics. The positivists viewed this science as expressing constant and necessary relations among the phenomena. In the neo-positivism, it was insisted that science is not a collection of propositions or theories whose correctness is confirmed or proven by experience. The first statement has the added advantage that indirectly it points out to the fact that science had an order. But the second statement is mostly the description of the work that the scientist does. Perhaps Feyerabend had this in mind when he said-and in his opinion one cannot put it any better than this-that science is that which the scientist does. One can find fissures in these so-called definitions. For example, one can ask whether the constant relations among the phenomena are external relations, and that science recognizes the things and relations as they are, or as Kant used to say, these relations derive their constancy and necessity from the human understanding.

If through science one can understand the phenomena of nature, the understanding of each phenomenon depends on our faculty of perception. A phenomenon does not have an independent being. But when some say that science is composed of propositions which are either proved or refuted by experiment, they still have not defined science, but have tried to describe the features of a scientific proposition.

However, is it not true that if we know the description and nature of the statements and propositions of a science, then we know that science? But here the question does not revolve around the nature of the problem, but around the way in which the problems are proven or refuted. In effect, it would be as if it were said that science is a collection of propositions which can render themselves to scientific investigation. Let us assume that we know the description of scientific propositions. For example, we accept that there are statements and propositions that are proven by experience, and scientific judgments are among these types. In this case, have we found the essence of science? This is not a description of science; it is a brief account of a viewpoint and philosophical perception of science. What should be stressed here is that there is no common feature in the two aforementioned statements. But, how would it be possible then to define, with one or two statements, two things that do not mean the same thing and are not convertible to each other? In the first statement, science or scientific judgment has been described on the basis of its subject matter, whereas in the second description, the subject matter and object of science have been completely ignored and the focus has been on the method and form. But a more difficult question in the second description is: Where does theory come from, and how is it constructed, and if the theory is not derived from experience, how can experience be the measure for the truth or falsity of scientific judgments? Can science have a measure outside of itself, a measure which would not be in the same category as science? Of course, method is very important in science. It is so important that one could say that science is investigation, and investigation is applying a design on beings based on method. As we see in this definition, the status of technique in the nature of science has been duly recognized. However, we should not consider it as a definition of science. We cannot define science. There are plenty of ambiguities and differences of opinion regarding the source, conditions, possibilities, exigencies and effects of science, as well as on the relationship between science, history, culture and metaphysics. How can one define science if it does not have a beginning, and its beginning dates back to man's prehistory, and its end cannot be predicted? Essentially the question about the nature of science is one which belongs to the domain of philosophy and in each philosophy a manifestation of science appears. Hence, it is possible that someone would say that science is the same as quantification, and still someone else might call science [a way of] forecasting. It is possible that some experts would regard science as true because it fulfils our demands and needs. In the language of religion and metaphysics, science is defined in a different manner. For example, it is possible to say that science is among the manifestations of the majesty of the Lord, and, amazes man. Because the path to the Sacred passes through [the realm of] amazement, perhaps through science man can reach the Sacred dimension. The great philosopher of the Islamic world, Mulla Sadra, considered science as a manner of existence. He viewed science as possessing analogical gradation. When anyone of us speaks of science, we intend a certain stage of it, and one cannot understand the truth and the stage without referring to the totality. If we are supposed to define particular science, this definition must be with a view to general science. Since in the contemporary philosophy of science, universal science is not discussed, it would be difficult and baseless to define science.

Now we must define religion. If science does not have a definition, how can one define religion? Religion is love. It is submission. It is servitude [to God]. It is submission [to the will of God]. It is a covenant. These are all true. But this is still not a definition. If we review, and describe, the religious statements and actions of the man of religion, we still cannot consider it a description of religion. Anthropologists, sociologists, psychologists and philosophers usually look at religion from outside. Each is trying in a special way to come up with general definitions of religion. It can be summarized, from what has been said in different disciplines that religion is belief in the Sacred, acting on the basis of religious decrees and required rites. But the difficulty is in understanding the meaning of the belief, especially the belief in the Sacred. What is the Sacred? How do we understand the Sacred and the Transcendent and how do we believe in them? For instance, the understanding of the one who sees religion rooted in man's fear is quite different from that of the person who views man as a being who is by nature religious. Before defining religion, we must know what relations there are between man and religion. If man is connected as much with religion as he is with irreligion, and this relation has come about by accident, in effect these are two independent entities, and while man examines religion from the outside, he can understand religion to a degree. But if man's nature is mixed with religion, in that case, in the understanding of religion, the believer himself is involved as well; one cannot look at religion divorced from the outside world and in a vacuum. For the moment, I decide against getting involved in these debates. What I want to say is that man became man with the Covenant he made in time immemorial. The beginning of religion starts with the Covenant of the past. Whatever religion encompasses-laws, decrees, its decrees on what is prohibited or permissible, its rites and rituals-are the result of that Covenant. But we have to be careful not to view this Covenant as a covenant between two independent entities. This is a special Covenant. We were asked, while we were only a potentiality, "Am I Not Your Lord?" and we responded positively to the question in the language of our potentiality. With this response, we became a human being, and carried the burden of that which has been entrusted to us. The emergence of man, the advent of religion and belief in religion was indeed an event. Man became man after he made a Covenant, and his Covenant was of a religious nature. Some say that if religion had been innate in man, then all of the people would have been religious, and no one could have been able to reject religion. These people do not understand that religion is a covenant and it is possible that one would forget or break a covenant, in which case they are covenant-breakers. With this statement, we have indeed admitted that religion does not belong to us; we have admitted that it is we who belong to religion, and how can a component of an entity define the entity to which it belongs?

2. Do you see any conflict between your definitions of these two concepts?

When providing a description, hardly any conflict arises between religion and science, and if there is a conflict, it is in the sub-principles and conclusions. In fact, there is no conflict between science and religion. No scientist can deny the existence of the sacred source by resorting to science, and view worshipping as a futile act. But sometimes there is a conflict between scientific research and religious absolutes. Earlier thinkers used to say that if a conflict arises between the dictates of reason and the religious decrees, one must interpret the religious decree. This perception, especially in the past two centuries, has led to the interpretation of the religious statements in harmony with the universally accepted scientific facts. For example, some of the researchers and even some of the jurisprudents have adjusted the account of the creation of man to the evolution theory. Perhaps these attempts are not that significant but they are not without justification either. If they view the language of religion and science as one, and if they divide the religious decrees to descriptive and prescriptive decrees, and view its descriptive decrees of the same type as the descriptive scientific propositions and subject to investigation based on the scientific method, they would have no choice but to take the side of science in case there emerges a conflict between science and religion. This is due to the fact that from the beginning they have understood the language of religion as similar to the language of science and have scientifically approached religion, If our yardstick is the language of science and scientific theories, and religious statement has to be interpreted such that it would go along with science, still the language of religion would be different from the language of science: The religious statement, once interpreted, does not mean the same thing as what it seems to say. If it were so, would there be any need for analogy and interpretation? If we look closer, we realize that there is no conflict between science and religion. Actually, the conflict is between the theologians and scholars or between theology and some parts of the scientific theories or a specific interpretation of these theories. However, in educational textbooks or the like, and in the opinion of those who limit scientific judgments to investigation, research, refutation and proof or testability, and contend that scientific judgments could bed either confirmed or approved, or investigated and refuted, either deliberately or unconsciously, they have created a confrontation between religion and science. Especially when having meaning would mean that it is testable (the view held by most members of the Vienna Circle), one cannot test and investigate a religious decree in the same manner that one would with routine scientific hypotheses and theories (of course, grand scientific theories, too, are not provable or refutable in their totality). The point that needs to be considered here is the meaning of experiment and investigation. If we intend the general meaning of experiment, undoubtedly it would include religious, moral and mystical experiments. Hence, it could no longer be considered a characteristic exclusive to science and scientific research. But the statement that decrees are meaningful only when they can be investigated through scientific methods cannot be supported and the men of science reject such statements. Hence, if someone says that the definition of science is in conflict with the definition of religion, he can hardly justify his own words.

3. Where do you think there may be a conflict between these two?

The way is paved for the emergence of conflict whenever and wherever they want to evaluate religious decrees with scientific measures, and especially view its language of allusion as identical with the quantitative language of sciences. But if the boundaries are clearly recognized, the belief in the religious principles and exigencies would never hinder scientific investigation anywhere. But sometimes some of these dependencies create or destroy the context for doing scientific research. However, whatever is not considered as preconditions for scientific research and does not pave the way for it, is not opposed to science.

4. What have been the grounds for the development of conflict between these two?

In the past periods, there was no contradiction between science and religion. The conflict between reason and religion has been discussed since the time of Plato. From the beginning of the Hellenistic era and Alexandrian period, this conflict was intensified somewhat. Muslim philosophers and theologians from the Christian era tried to somehow resolve this conflict. The result of the efforts by Muslim philosophers and researchers such as Khwaja Nassir-al-Din Tusi and Fayyaz Lahiji is that reason and religion are not at all opposed to each other. If some of the mystics denigrated science, they were referring to a science which serves as a veil.

5. What has been the role of religion in the development of science in the West?

The people of Iran and those in the regions considered the Islamic lands were able to learn the sciences of the Greeks, Chinese and Indians before accepting Islam. But as we know, they did not show any interest or desire [to learn these sciences]. But with the expansion of Islam, the interest in science grew. Seekers of knowledge traveled from remote regions in order to learn sciences. In less than 80 years, sciences such as medicine, astronomy, mathematics, alchemy and philosophy arrived in the world of Islam from India and Greece. Despite the perception common among some historians of science, the sciences of the Islamic era did not have a stillbirth. Rather, they were like dynamic newborns who grew to their maturity. But, it would not be appropriate or right to compare the growth and vitality of the sciences of the Islamic era with those of the Renaissance period in Europe.

6. Can we have a religious science?

One understands two things from the term "religious science". One is a science which is about religious questions and discussions. The other is a science which has acquired religious characteristics, even though it is not necessarily connected with religion and is separate from religion. Undoubtedly, the second type of science is intended when it is asked whether it is possible to have religious science. If we approach the issue from an abstract perspective, we realize that logic, mathematics, physics and sociology would not become religious sciences, and there is no need to make them religious, and it is possible to say that speaking of Islamic physics and geometry would be meaningless. These statements, as has been stated before, are generally understood to imply that a person has only engaged in an exercise of futility if he decides to make mechanics and astronomy Christian or Islamic. In whatever world the sciences are, they acquire the characteristics of that world. They also rotate around the axis, as well as serve the interests, of that world. As far as we know, the only non-religious world in the history of man is the modern Western world. The non-religious thought and science began in Greece. The Greek world was non-religious and their science, too was non-religious. But if the modern non-religious world would be transformed to a religious world, i.e. this world would vanish and a new world would emerge for which religious thought would serve as the backbone, then science, too, would be under the shade of religion, and would become religious in a sense.

7. Can science dispense with religion?

Apparently, science can be independent from religion because the fundamentals of science are not the same as the principles and fundamentals of religion, and scientific judgments are rarely mistaken for religious decrees. Not only the modern science is independent from religion, but also the science of perspectives, astronomy, mathematics and mechanics of the earlier people were not religious and would not have any relations to religiosity. But one could discuss the issue in a different way. One could imagine that if man had not had any religion, would science have evolved to become what it is today? Would science have been possible at all? We do not know what man would have been if there had been no religion. Man became man with the Covenant, and if this Covenant had not been there, man would not have become possessor of science, technique, ethics and politics. It might be said that this statement contradicts what have been considered established facts, because millennia of growth and development of science in the religious contexts are not comparable with the 200-year or 300-year growth of science in the modern non-religious world. It is true that the modern world is non-religious but this world follows a religious world. In the modern world, pseudo-religious interests have taken the place of religious interests. The existence of this world depends in many ways on religion and religious beliefs. Modern science too, has roots in metaphysics and religious thought. I do not want to dwell on what has been said about the Christian foundation of modern civilization and science. Suffice it to say that if religion had not been there, we would not have known about truth. The dependence of science on truth is of the same type as the religious quest. Actually, science has borrowed the concept of truth from religion and has given it another meaning. Even though science, in its abstract form, is independent from religion, when all the conditions for emergence of science are considered, then we realize that it is connected with religion.

8. Can one separate the domains of activity of science and religion completely?

Based on what has been said in the seventh question, the domains of science and religion are in one sense independent from each other. But if we consider it with a view to unity, both are rooted in the same source.

Prof. Edward B. Davis

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Post-Doctoral Professional Experience: Assistant Professor of Science and History, Messiah College (Mechanicsburg, PA), 1985-1990; Associate Professor of Science and History, Messiah College, 1990-1996; Professor of the History of Science, Messiah College, 1996 - 2021.

Principal Books: *Robert Boyle, A Free Enquiry into the Vulgarly Received Notion of Nature* (Editor, with M. Hunter), Cambridge U.P., 1996; *The Works of Robert Boyle* (Editor, with M. Hunter), 14 Volumes, Pickerring & Chatto, 1999.

1. What is your definition of science and of religion?

Science is the quest to understand and to control nature (which I view as an order created freely by God). Religion is the quest to understand and to respond to God (whom I view as the creator of nature and the redeemer of humankind).

2. Do you see any conflict between your definitions of these two concepts?

None whatsoever. However, others (who may define science and/or religion differently) may well see conflict.

3. Where do you think there may be a conflict between these two?

As an historian of religion and science, the presence of genuine conflicts at specific times and places in history is obvious to me. This is very far from stating that CONFLICT is in fact the general relation between religion and science. As I like to tell my students with an equation, conflicts ≠ CONFLICT, any more than it would be accurate to describe the relation between the United States and Great Britain as one of conflict. The challenge to historians of religion and science is to understand *why* people sometimes differ very deeply over matters that are important to them, and to discover *how* religion and science have influenced one another. The objective historian will find not only some instances of conflict, but also many instances in which religious beliefs have shaped science in very positive ways as well as instances in which science has shaped religious beliefs in positive ways. A further challenge is to communicate this result more forcefully to the scientific community, which has tended to endorse the conflict thesis because it has added to the cultural authority of science.

4. What have been the grounds for the development of conflict between these two?

When specific conflicts occur, they tend to arise either when scientists make unproved metaphysical statements in the name of science or when religious believers make scientifically false statements for religious reasons.

5. What has been the role of religion in the development of science in the West?

In a word, profound. Monks kept science and other learning alive in Western and Northern Europe during an otherwise very difficult period following collapse of the Roman empire. In the high middle ages, theologians called on scientists openly to acknowledge God's freedom in their scientific theories, which suggested new, non-Aristotelian possibilities that leading scientists explored in fascinating ways. A renewed emphasis on divine freedom in the wake of the Protestant Reformation helped in the acceptance of atomism and positively encouraged scientists like Boyle and Newton to favor empirical approaches to knowledge over rationalistic ones such as those favored by Descartes and Leibniz. And, underlying all Western science are theologically – based assumptions about the unity, comprehensibility, law likeness, and value of the universe as the creation of a rational, consistent, and good creator.

6. Can we have a religious science?

This depends very much on how we understand the term. I do not follow those who, like the Nazis, believed that relativity theory had to be rejected as "Jewish science", or those who, like the Stalinists, rejected Mendelian genetics as "bourgeois science". Nor will I follow religious fundamentalists who reject evolution as "evil-ution" and put "scientific creationism" in its place as what they consider "Christian" science. The truthfulness of theories (whether genuine or apparent) is independent of the cultures and beliefs of those persons who create them, even if there are aspects of a culture that were particularly important in the creation of a given theory. On the other hand, I strongly agree that we can identify (and should expect to be able to identify) specifically Jewish, Christian, Islamic, or Marxist *views* of science. For example, though I do not accept the claim that relativity theory is "Jewish science", I think it is valid to speak of one or more "Jewish views of science", that is, distinctively Jewish ways of relating science to other parts of human life and culture. And likewise for other religious beliefs and political/social philosophies. I am also comfortable with terms such as "Islamic science", when used to refer to the entire scientific enterprise within Islamic culture as a whole. The danger arises when similar terms are used to describe individual theories, usually for ideological purposes.

7. Can science dispense with religion?

Scientists as individual human beings can, and do, dispense with religion – just as other human beings dispense with religion. The decision to lead or not to lead a religious life is an individual one, made by individuals rather than by impersonal entities such as "science". Perhaps the question meant to ask whether scientists are more prone than other persons to dispense with religion. If so, I think the answer is "yes", that scientists are somewhat more prone to dispense with religion (at least with traditional religion) than are most non-scientists. However, some other types of persons, such as journalists, may be even more prone to dispense with religion. And within science, not all types of scientists are equally prone to do so; for example, physical scientists tend to be more religious than biological scientists, who tend to be more religious than social scientists. The reasons for this are unclear, but I suspect that the tendency of certain scientists to live without religion is partly a product of a narrowly technical education, with the feelings of cultural superiority that often accompany it, and partly the product of a general scepticism about all sorts of things that is encouraged by the acceptance of scientists standards of evidence (Journalists, I note, are no less skeptical about people's beliefs and actions than scientists are about people's truth claims).

On the other hand, historians of religion and science recognize that science itself has actually functioned as religion for quite a few scientists, especially since the late nineteenth century. That is, a number of scientists have looked to the scientific enterprise rather than to religion for hope, mystery, and meaning. For such persons, religion has not been "dispensed with", rather it has been replaced with a different form of religion based on science.

8. Can one separate the domains of activity of science and religion completely?

In principle, yes, but in practice, no. History is replete with examples of religious beliefs functioning as scientific theories and scientific theories functioning as religious beliefs.

Prof. Giuseppe Del Re

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Post-Doctoral Professional Experience: Assistant Professor of Chemistry (1954-59), Associate Professor of Physics (1962-69), Professor of Theoretical Chemistry (since 1969), University of Naples; Invited Professor at the Ecole Normale Supérieur en Paris, University of Erlangen, Germany, etc.

Current Areas of Research: Theoretical Chemistry; Foundations of Science and Cultural Status of Science.

Publications: Over 170 scientific papers; Editor of a book on the Brain-Mind Problem, published by the Pontifical Academy of Sciences.

1. What is your definition of science and of religion?

Science is the mental and practical activity by which man situates himself in his environment, and tries to satisfy his need to understand what happens in it by

– isolating among his sensations those which appear to be independent of the individual observer, and hence are likely to correspond to features of reality outside him;

– correlating those observations with the help of cause-effect relations;

– establishing general principles and rules which govern all the observed phenomena and their relations. Religion is the response to a fundamental need of man, that of finding an Entity (or possibly entities) which transcends his self and his instinctual drives, and towards which he is responsible for what he does, over and beyond the laws established by society.

2. Do you see any conflict between your definitions of these two concepts?

The two definitions are not in conflict. Indeed primitive peoples tend to explain every phenomenon as due to the direct action of God or of lesser spiritual entities. What I believe is that God's will is indispensable for things to be what they are and to change as they do in every single instant; but, since God wants us to collaborate with him by our free choice, he gives us certain tools, the main one being the 'intelligibility' of Nature, which makes science possible. In short: to say that a drop of water falls because of gravity is not in conflict with saying that it falls because it is God's will that it should do so and precisely so.

3. Where do you think there may be a conflict between these two?

A conflict may arise if the very special nature of the human person is ignored, because then one rejects the need for a moral code and *a fortiori* for religion.

4. What have been the grounds for the development of conflict between these two?

Conflicts have arisen for one or more of three reasons:

– one satisfies one's need of God by putting in His place one's own self (often disguised as 'human reason');

– one has a childish idea of God as the Entity whose essential role is to help people in difficult situations; then it is easy to show that science is more effective than prayer, and to claim that there is no God.

– one chooses the easy way, *i.e.* interprets the Books containing the Word of God literally, without taking into account the limits of his personal ability to grasp its depth, and therefore may take apparent contradictions between science and Revelation as proofs against religion or against science.

5. What has been the role of religion in the development of science in the West?

The idea of a personal God who has created the world implied since the beginning of Christianity that the intelligibility of nature is a gift of God and that man's calling includes the search for knowledge and truth. The resulting encouragement to the search for knowledge through observation and reasoning, and the respect for truth regardless of what could please or displease the establishment, created the cultural conditions for the development of modern science.

6. Can we have a religious science?

True science ought to be religious, for nature was created by God, and it is by His benevolence that we are allowed to understand some of its secrets as well as to control or modify some of its operations.

7. Can science dispense with religion?

Science can dispense with religion, but then it quickly becomes a tool of the lust for power or a mere divertissement; in either case, it is no longer primarily the search for truth, and will degenerate until intellectual dishonesty and personal interests destroy its potential for progress. We are witnessing such a process in much contemporary scientific research.

8. Can one separate the domains of activity of science and religion completely?

For the reasons given above, the domains of science and religion cannot and should not be separated. Nevertheless, the danger exists that theologians may impose their *deductive* way of thinking, and forget that honest truth can never be in contradiction with the Word of God. Therefore, as long as it does not interfere with respect for the human person, science should be allowed to proceed independently of religion; and apparent contradictions with the Revelation should be discussed on equal terms and with great humility by theologians and scientists.

Prof. Joseph Emmett Earley, Sr.

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Education: B.S. degree in Chemistry, Providence College (1954); Ph.D. in Physical and Inorganic Chemistry, Brown University (1957).

Post-graduate Experience: Research Associate, University of Chicago (1957); Assistant Professor to Professor of Chemistry, Georgetown University, Washington, D.C. (1958-99); Chairman of the Chemistry Department (1984-1990), Georgetown University; Visiting Associate at the California Institute of Technology (1967-68); Guest Researcher , the Free University of Brussels (1976);Visiting Professor, Nonlinear Dynamics Center, The University of West Virginia (1997-98);Chemistry Program Officer, US National Science Foundation (1999-2003); Currently, Emeritus Professor of Chemistry and Adjunct Professor of Liberal Studies, Georgetown University

Publications: Over 100 papers, reviews and chapters on mechanisms of inorganic reactions in solution and also on chemical solutions; over 25 papers and chapters, and two edited volumes, on the relevance of recent developments in science for philosophy and religion.

1. What is your definition of science and of religion?

Both science and religion, as I understand the meaning of those terms, are intrinsic parts of human life. Science, broadly understood, is the human effort to understand the world we live in, and how that world functions. Religion, also interpreted in the most general way, is how a particular community celebrates, expresses, and passes on to coming generations, its understanding and appreciation of the past, of the present, and of the future.

2. Do you see any conflict between your definitions of these two concepts?

3. Where do you think there may be a conflict between these two?

4. What have been the grounds for the development of conflict between these two?

There is no *necessary* conflict between science and religion (understood in the broad way that I favor); but, in practice, such conflict (whether great or small) seems almost unavoidable. Science, by constant probing, questioning, and experimenting, generates knowledge, understanding, and (regrettably but unavoidably) sometimes false opinion. All of these are new – quite different from what has gone before. One of the main functions of religion is to pass on the accumulated wisdom of a people – a profoundly conservative task. That these two great communal undertakings come into conflict from time to time should not surprise anyone.

5. What has been the role of religion in the development of science in the West?

Although modern science may be said to have begun in the seventeenth century, it grew out of a lively philosophical and theological tradition that was closely connected with religion. The habits of mind that made the development of science possible were formed by religion. The translation of works of Islamic scientists and other scholars (in twelfth century Toledo, for instance) ignited the flame of philosophical exploration in the West from which modern science issued. Since that time, many of the most productive men of science have also been religious, and those that were not themselves interested in religion, often came from religious families or traditions. Even when active scientists have had no religion, or even been actively anti-religious, the ideas by which they did their science had profoundly religious origins.

6. Can we have a religious science?

There are many questions of deep religious interest that require clarification by science (particularly in the area of the social sciences). Religion may inspire investigations, but guidance by religious authority will generally be disastrous in the conduct of scientific research itself.

7. Can science dispense with religion?

To do science well requires a deep commitment to the "order of Nature" - the idea that, as Whitehead said "at the base of things we do not find mere arbitrary mystery". Science, itself and unaided, has not (yet, at least) shown itself able to engender this attitude where it is lacking (much of the world) or to pass that idea on to future generations. In my view, science is a parasite on religion, or to put the matter more elegantly, science and religion have an obligatory symbiotic relationship. It seems to me that if either of the two should fail (even in a particular community), the other will not survive more than one or two generations.

8. Can one separate the domains of activity of science and religion completely?

Progress in any developed field requires specialization. Clearly, we need both scientific and religious specialists. In each of these two categories, there will be many whose main attention is devoted to their specialty with scant attention to the rest of the world. But it is essential that there be many scientific specialists who are well informed in religious matters and (even more importantly) substantial numbers of religious leaders who are well educated in contemporary science. Providing arrangements to achieve this is one of the main challenges facing educators all over the world.

Prof. George F. R. Ellis

Date of Birth: Aug. 11, 1939 (Johannesburg, South Africa)

Education: B.Sc. in Physics (1960), University of Cape Town; Ph.D. in Applied Mathematics and Theoretical Physics (1964), Cambridge University (St. John's College).

Post-Doctoral Professional Experience: At various times, Visiting Professor, University of Texas (Austin), University of Hamburg, University of Alberta, Max Planck Institute of Astrophysics (Munich); Professor (since 1990), Applied Mathematics Department, University of Cape Town, South Africa; Winner of Gravity Research Foundation Essay Competition 1st Prize (1979); President of the International Society of General Relativity and Gravitation (1989-1992); Honorary Doctorates, Haverford College (Pennsylvania, USA, 1996) and Natal University (Durban, South Africa, 1998).

Principal Books: *The Large Scale Structure of Space-Time* (with S.W. Hawking, 1973); *Flat and Curved Space-Time* (with R.M. Williams ,1988); *Before the Beginning* (1993); *The Renaissance of General Relativity and Cosmology* (Edited with A. Lanza and J. Miller, 1993); *On the Moral Nature of the Universe* (with N. Murphy, 1996); *Th Dynamical System Approach to Cosmology* (with J. Wainwright, eds., 1996) ; *Is the Universe Open or Closed ? : The Density of Matter in the Universe* (with P. Coles,1997) ; *The Far Future Universe* (ed., 2002).

Awards: Herschel Medal (Royal Society of South Africa); Gold Medal (The South African Association for the Advancement of Science, 1993); Medal (South African Mathematical Society); Templeton Prize for Progress Toward Research or Discoveries About Spiritual Realities (2004).

1. What is your definition of science and of religion?

– Science is the systematic search for understanding of the way the natural world is structured and functions;

– Religion is the search for meaning that underlies the physical world and gives a guide as to how to live.

2. Do you see any conflict between your definitions of these two concepts?

I do not see any conflict between the definitions of these two concepts; they are concerned with different layers of reality which co-exist in the multi-leveled hierarchical structure of the universe.

3. Where do you think there may be a conflict between these two?

There is a conflict between them in the minds of people who have been misled, or have not looked at the different concepts carefully enough. However this is an apparent rather than real contradiction.

4. What have been the grounds for the development of conflict between these two?

The grounds for development of conflict has been the overzealous attempts from some of those on the religious side to claim for religion territory that is not its to claim, coupled with an arrogance of attitude and proclaimed certainty of knowledge that cannot be supported if one has a solid understanding of the foundations of knowledge. This has been compounded by a demonstrable devastating contradiction between the claimed beliefs of many of the Churches and other religious institutions, and their actual behaviour. The error is to believe that this problematic behaviour of some or indeed of most religious institutions is sufficient to undermine true religion or spirituality, which are not easily mirrored in any human institution.

Curiously, the situation is now to some degree reversed: while the vanguard of religious thought is now far more tentative than before, there are quite a few scientists who are presently demonstrating precisely those characteristics commented on above: arrogance and claiming complete certainty where it is in fact unattainable. They have taken on themselves the mantle of hubris that has been laid down by many religious thinkers.

5. What has been the role of religion in the development of science in the West?

I am not an expert on the role of religion in the development of science in the West, but it is my understanding that the Christian tradition, with its emphasis on the individual, cleared the way for the development of scientific thought.

6. Can we have a religious science?

No, not in the sense I have in mind: because of its nature and its approach to knowledge, science cannot deal with values and issues of meaning that are the concern of religion (and that are fundamental to everyday life). Science is matter-of-fact in its approach to reality; while a scientist may perhaps value the beauty of a rose or regard with awe the images of distant galaxies, in so doing he/she is stepping outside the confines of science itself. The themes it can deal with are measurable quantities such as mass, velocity, distance, force. It cannot cope with purpose.

7. Can science dispense with religion?

It is possible to have science that does so if it is sufficiently narrowly construed. However pursuing science to its limits necessarily raises metaphysical or philosophical issues that science itself cannot answer; and it is in the end incomplete without some approach to these matters, which inevitably to some extent must approach or at least consider religious issues. Furthermore applied science necessarily involves value choices that in the end are based on ethical viewpoints that cannot themselves be based in science. A philosophical or theological basis is needed to ground the ethics that are demanded in order that applied sciences can be coherently applied.

8. Can one separate the domains of activity of science and religion completely?

In view of the above considerations, one cannot completely separate the domains of activity of science and religion. It is also true that science provides the proper setting within which religious faith must be placed: namely our evolutionary origin in an ever-changing universe of vastly greater scale than humanity can easily comprehend, with the behaviour of matter taking place strictly according to the laws of physics that seem universal. This physical situation does not impose on us any philosophical or theological view of ultimate reality, but must be taken seriously by any such view if it is to be viable.

Prof. John Erik Fornæss

Date of Birth: October 14, 1946 (Hamar, Norway)

Education: Cand. Mag. in Mathematics (1967), Cand. Real, M.A. in Mathematics (1970), University of Oslo, Ph.D. in Mathematics (1974), University of Washington, Seattle.

Post-Doctoral Professional Experience: Assistant Professor (1976-78), Associate Professor (1978-82), Professor (1982-91), Princeton University; Professor of Mathematics (since 1991), University of Michigan; Visiting Professor at Several European Universities. Invited lecturer at several European and American Universities.

Awards: Max Planck Award (1990-1993), Germany; Bergman Prize (1994); CEHN Award (1994), France.

1. What is your definition of science and of religion?

Science describes the measurable physical properties of the Universe and its parts. Religion deals with spiritual issues, such as the purpose or goals of the Universe and its parts. Science is reductionist, describing the properties of a composite system in terms of the properties of its parts. Religion is holistic, viewing our purpose as individuals in terms of the larger whole, i.e. is top-down.

2. Do you see any conflict between your definitions of these two concepts?

I don't see a conflict between these two concepts. They deal with separate aspects of the same reality. To say that there is a conflict between science and religion is the same to me as saying there is a conflict between the ink used for this article and its ideas.

3. Where do you think there may be a conflict between these two?

One should distinguish between science and those who do it, the scientists; likewise between religion and the religious practitioners. I don't see a conflict between science and religion, but there are sometimes conflicts between scientists and religious leaders.

4. What have been the grounds for the development of conflict between these two?

Some scientists deny religion, perhaps because of lack of scientific proof. Also some religious people deny the validity of findings by scientists, perhaps because of discoveries that run against their interpretations of their holy scriptures.

5. What has been the role of religion in the development of science in the West?

The main role of religion in the development of science in the West has been to occasionally slow it down.

6. Can we have a religious science?

Since science and religion describe aspects of the same reality, one can try to integrate these approaches. For example, the spiritual goals of a religious group influence the individuals and vice versa, the behaviour of the individuals affects the whole group, perhaps leading to modifications of the spiritual goals, etc. There is a complicated relationship between top-down and bottoms-up influences in any composite system. This could perhaps be developed into something called religious science.

7. Can science dispense with religion?

Science, philosophy and religion provide ways of relating to the world. They describe aspects of the same reality. Science cannot dispense of religion. Science only provides a bottom-up description of the Universe, describing complex systems in terms of their parts. To describe how a complex system develops, one also needs to take into account the top-down influence of religion.

8. Can one separate the domains of activity of science and religion completely?

The spiritual goals of religion and the physical properties of science are both used to describe individuals. To have the best development, one should rather combine these aspects. Hence, one should rather strive to integrate the domains of activity of science and religion than separate them.

Dr. Peter Fulljames

Date of Birth: 1938 (Yorkshire, UK)

Postgraduate Experience: Teaching Physics in England, India and Kenya; Teaching Theology in the School of Mission and World Christianity at Selly Oak Colleges, Birmingham; Honorary Lecturer, University of Birmingham; Doing Research on the attitudes of young people towards science and religion.

Publications: Author of *God and Creation in Intercultural Perspective* (Lang, Peter Pub. Inc., 1992).

1. What is your definition of science and of religion?

The aim of science is to explain natural phenomena in theories tested by observation and experiment. As with all human discourse, scientific theories are to some extent shaped by the cultural context. Religion is a response to the transcendent by which meaning is provided and human lives are transformed. A particular religion is a cultural or multi-cultural tradition of faith and practice, usually including doctrines, narratives, ritual action, spiritual experience, ethical norms and social institutions.

2. Do you see any conflict between your definitions of these two concepts?

No.

3. Where do you think there may be a conflict between these two?

There may be conflict if there is misunderstanding in science or if there is misunderstanding in religion.

4. What have been the grounds for the development of conflict between these two?

I will give two examples that relate to Christianity. The claim that a human being is nothing but the sum total of physical and biological processes in the cells of the body is in conflict with the Christian belief that humans are created for relationship with God. Here, there is a misunderstanding of science; for, although scientific theories satisfactorily explain many aspects of human life, they do not exclude the possibility that other perspectives on human life may also be of value. Furthermore, even when scientific theories are widely accepted, they are open to modification as a result of further observation and experiment.

The second example is the conflict between a literal interpretation of the creation narratives in Genesis and evolutionary accounts of the origins of life on earth. Here, there is a misunderstanding of religion; for, within the Christian tradition, there can be new interpretations of biblical narratives in the light of new knowledge, as long as these interpretations are consistent with the revelation of God in Jesus Christ. The creation narratives are important because they express the faith that all things depend on God and that the created world is essentially good, but the details of the narratives merely reflect ideas about the natural world that were prevalent in the society from which the narratives came. It is to be expected that scientific enquiry will lead to new understanding of the details of the origins of life on earth.

5. What has been the role of religion in the development of science in the West?

Many scientists have been motivated in their work by their religious belief. The Christian doctrines of creation and incarnation have provided support for assumptions that are essential in scientific enquiry: that there is order in the processes of the natural world and that matter is of such value that it is worthy of close attention. Historians have also shown how the development of science in the West has been influenced by Islamic philosophy and science.

6. Can we have a religious science?

It depends on what is meant by religious science. For Christian, scientific enquiry as any other activity takes place within the framework of meaning provided by Christian doctrines and ethical norms. Yet, each scientific discipline has its characteristic methods of enquiry which usually are used by scientists whatever their religious beliefs may be.

7. Can science dispense with religion?

No.

8. Can one separate the domains of activity of science and religion completely?

Science and religion each have their own integrity; yet, interaction between the two can be mutually beneficial.

Prof. Karl W. Giberson

Date of Birth: May 13, 1957 (Bath, New Brunswick, Canada)

Education: BS (Physics/Math), BA (Philosophy) from Eastern Nazarene College (1979); Ph.D. (Physics) from Rice University (1984).

Post-Doctoral Professional Experience: He taught physics and general education from 1984 to 2011 at East Nazarene College, before moving to Stonehill College where he became their first Professor of Science & Religion. For several years he edited *Science & Spirit* and *Science &Theology News.*

Awards: In addition to awards for Teaching Excellence and Professional Achievement, he won a Templeton Foundation Award for Outstanding Course in Science and Religion (1996). Rice University awarded him the Wilson Award for outstanding dissertation.

Publications: He is the author of ten papers on lasers and atomic physics; hundreds of essays, reviews, and papers on science & theology. He has published eleven books, including *Oracles of Science: Celebrity Scientists versus God and Religion* (with Mariano Artigas), which has been translated into several languages; and *Saving Darwin: How to be a Christian and Believe in Evolution*, which was recognized by the Washington Post as a "Best Book of 2008."

1. What is your definition of science and of religion?

We cannot define science & religion in a way that does justice to both. Any definition will be open to criticism. Nevertheless, I would define science as "that which deals with truth-claims about the natural world defended on the basis of observation." I would define religion as "that which deals with truth-claims defended on the basis of values or meaning, in conversation with religious tradition." Science is easier to define than religion.

2. Do you see any conflict between your definitions of these two concepts?

Yes, there is clear conflict because of the impossibility of completely separating observations from the fact – value dichotomy that has so long been a part of the Western philosophical conversation. For example, in the Christian Tradition, considerable religious significance is attached to a number of *observations* recorded in the Bible. Whatever their actual historicity, the *observation* of the parting of the Red Sea, the *observation* of the giving of the 10 Commandments, and the *observation* of the bodily resurrection of Jesus are examples of this. Nevertheless, I would argue that the *primary* religious interest in these historical events is the *value* or the *meaning* attached to them, rather than the events themselves. The Christian Tradition has long recognized the difference between the claim that "Jesus rose from the dead" and "God raised Jesus from the dead". The former is a claim that could, in principle, have been investigated scientifically, while the latter is a faith claim that makes an assertion that goes beyond the observation. In the same way, science has certain values – simplicity, naturalism, symmetry – that guide its investigation of the world. To say that these are not "values" is to miss some of the most useful driving forces in the history of science. Yet, they are not "values" in the same strong sense that religion might use the term.

3. Where do you think there may be a conflict between these two?

The notion of conflict is greatly exaggerated. Virtually all of science is so irrelevant to religion that it is hard to find even points of *contact*, much less *conflict*. The famous metaphor of "Warfare" between science and religion is due to our unfortunate enthusiasm for controversy. It is this enthusiasm that has made Galileo, Darwin, and John Scopes so famous, while Maxwell, Bohr, and Weismann are known only to the scientifically literate. If you query a typical practicing scientist – chemists working on new house paints, physicists launching cable TV satellites, biologists trying to find vaccines–about the religious implications of their work, they will have nothing to suggest. Conflict emerges in those areas where both science and religion have a vested interest – the origin of the universe, life, and humankind; the basis of human nature; the relationship between humans and animals; etc. But one has only to open a scientific journal to realize that most scientists are not working on these problems, and the ones that are are not focused on the points of controversy.

4. What have been the grounds for the development of conflict between these two?

In most cases, the grounds for conflict has had nothing to do with the actual scientific or religious content of the case. For example, the Galileo affair emerged because of certain political developments within the 17th century Roman Catholic Church. The heliocentric hypothesis that Galileo embraced and taught was not itself highly problematical; what was problematical was the way that this critically anti-Aristotelian viewpoint undermined some of the historical authority of the Roman Catholic Church. Copernicus' book was placed on the Index in Italy where the political situation was volatile, but not in Spain, where the political situation was much different. Galileo was tried and condemned in Italy at the same time that his ideas were being taught by Catholic missionaries in China. Galileo's infamous trial—the focus of so much attention across the centuries and even today—was not fundamentally a conflict between science and religion. The fact that it is so widely (mis)perceived owes more to the polemical powers of anti-Christian writers like Voltaire and Diderot, who used it in their propaganda campaign against the Christian church, than to the heliocentric hypothesis which was the nominal focus of the trial. Of course, there are many important places where legitimate conflict has existed and continues to exist. For example, Darwinian evolution cannot be harmonized with the Biblical account of Creation without abandoning some of the key emphases of the Biblical account. Less conservative Christians have made their peace with Darwin by changing the way that they understand the Bible; but many Christians are trying to preserve the Biblical account by attacking or modifying the theory of evolution. Conflict ultimately arises because the Biblical origin stories come from a mythological tradition but we now read from within a much more scientific culture.

On the other hand, many thinkers–Richard Dawkins, Daniel Dennet, Sam Harris–are insistent on extending scientific explanation until it has swallowed up all possibility of there even being any religious perspective on the world. For example, many religious traditions have long held that universe has a *purpose* – that not everything is due to blind laws and mindless chance. This purpose finds its origin in a creator affirmed as the ultimate origin of all that exists. This religious affirmation has very little scientific content and scientists who affirm it ("We believe that God is the Creator...") generally find that it raises absolutely no problems for their scientific investigation of the world. Nevertheless some very popular and influential public figures are positively evangelistic in their zeal to convince everyone that there is no purpose to anything in nature. This claim goes far beyond what science has.

I should also note that in the United States we have a dynamic demographic of biblical literalists who reject large swaths of science. This movement, long predicted to collapse, continues unabated in its rejection of evolution, the Big Bang, and other central ideas in science.

5. What has been the role of religion in the development of science in the West?

Religion has played a number of roles. During the first millennium, while Western Civilization and culture were disintegrating, scholarship and learning in the West were kept alive in the service of the church. The brilliant and creative thinking that emerged during the Renaissance was only possible because (1) The church had maintained a high level of literacy and intellectual sophistication among its leadership; and (2) Greek culture, especially Greek science, had flourished in the Islamic world, from where it was "imported" to the West. If the church had allowed its religious culture to disappear along with the rest of the Western tradition, there might not have been a Renaissance.

There are also several intriguing—albeit controversial—connections between the Christian Tradition and the birth of science. Christian Theology has long taught that: (1) Nature was rational and orderly, being the creation of a single rational God. This implied that nature was *de-animated* – not filled with numerous "spirits" that would make it unpredictable, irregular, and not amenable to scientific investigation. (2) The rational order of nature was reflected in the rational powers of humankind, who had been created in the "image" of the Creator. It was thus conceivable that the human intellect might be able to discover the patterns on which the Creation had been built. (3) There were resources in nature that could be used in the ministry of the church. This practical concern motivated many church leaders to study medicine, for example. (4) The discovery of the patterns in nature was a legitimate act of worship, a way of praising the Creator. These four motivations, in varying degrees, certainly played a role in the thinking of those scientists responsible for the scientific revolution; whether or not this role was *essential* is difficult to determine. Certainly, these beliefs are not *sufficient*, or science would have emerged a thousand years earlier. But, it can be argued that one or more of these beliefs may very well be *necessary* for science. During the latter part of the first millennium, while Western culture and Greek science were disintegrating, science was flourishing in the Islamic community – where a similar "Theology of Creation" was influential.

Scholars might never agree on the extent to which science owes its origins to religion but a case can be made that the Judeo-Christian theological perspective on creation played a substantial, perhaps central, and possibly even necessary role in the emergence of modern science.

6. Can we have a religious science?

If by a religious science, we mean a science where the appropriate religious meaning is attached to scientific theories then I doubt that we can have a religious science. Science is successful largely because it does not address the "big" questions that have long been the concern of religion – Where did everything come from? Why is there something rather than nothing? What is the purpose of human existence? Are there other "realities" beyond this present world? I cannot imagine how science could even begin to *think* about these questions, must less answer them. Science seems smart largely because engages only the easy questions. If you asked me, in my role as a scientist, how to determine whether or not the human personality survives death, or what the purpose of gravity is, I would have no idea how to even begin thinking about the question.

On the other hand, if by a religious science we mean a science appropriately humbled and open to the insights of religion, then I think such a science is possible. We live in a time when questions of meaning are being joined to questions of fact in areas like climate science, fetal development, species extinction, gender complexities and so on. Religion is an important conversation partner for science in such cases.

7. Can science dispense with religion?

Certainly most scientific activity takes place without religion. This is not, however, because science has dispensed with religion, but rather because religious considerations are simple not explicitly relevant. What, for example, has religion to say about continental drift? But, science is a big enterprise and its boundaries have always been difficult to locate, and have even moved historically as religious type questions became scientifically investigable. The practice of science generates new questions and these questions are sometimes at or beyond the boundary of science. Current cosmological speculations about other universes, the development of human nature, and the spectrum of genders straddle the boundaries of science and raise religious questions. As long as science has a "cutting edge," it will, no doubt, find itself engaging religion.

And we must keep in mind that science is done by scientists and that, as human beings, scientists are often religious. We can certainly ask scientists about their *purpose* when they wrote books arguing that there is no purpose in the world; or why they do science in the first place; or how they decided to go into biomedical research; or why they think that certain types of DNA research should be prevented.

8. Can one separate the domains of activity of science and religion completely?

No, not completely, but we must take care not to be so distracted by controversies that arise in the ambiguous borderland between science and religion that we fail to notice the huge peaceful communities that do not live near that border. It is instructive to pick up a theological text and hunt for discussions of interest to science. There are not many. In the same way, it is even harder to find topics of religious interest in a science text.

Prof. Niels Henrik Gregersen

Date of Birth: June 16, 1956 (Aarhus, Denmark)

Education: M.A. in Theology, University of Copenhagen (1983); Ph.D. from the University of Copenhagen (Denmark, 1987). Studies in Munich (Germany, 1982). Pastoral training (1983).

Post-Doctoral Professional Experience: Research fellow, University of Copenhagen (Denmark, 1984-87); Assistant Professor at the Department of Ethics and Philosophy of Religion, University of Aarhus (Denmark, 1987-89); Associate Professor at the Department of Systematic Theology, University of Aarhus (1989-2000); Research Professor in science and theology at the Department of Systematic Theology, University of Aarhus (2000); Professor of Systematic Theology at Copenhagen University (2004) ; Pastor (1993); Since 1992 a leader of the Danish Forum for Science and Theology;1998-2002,Vice-President of The European Society for the Study of Science and Theology (ESSSAT);2002, Co-Founder and Trustee of the International Society for Science and Religion (ISSR).

Primary Research Fields: Systematic theology; science and religion.

Publications: His list of publications contains more than 700 publications, including 7 books and 25 edited volumes. Among his books are: "Information and the Nature of Reality (Cambridge University Press; Canto Classics 2014, with Paul Davies); Naturalism and Beyond: Religious Naturalism and Its Alternatives (Leuven: Peeters 2016, with Mikael Stenmark), and Internationalization and Re-Confessionalization: Law and Religion in the Nordic Realm 1945-2017 (Odense: University of Southern Danish University 2020, with Pamela Slotte)".

Awards: Several European and American awards. In 1999, he was the recipient of a research award of $100.000 from *The John Templeton Foundation.*

1. What is your definition of science and of religion?

'Science' may be described as an empirically based and systematically pursued inquiry into the structures and processes of nature. As such, the natural sciences study objects of nature at different levels using a variety of methods and following disciplinary standards pertinent to the individual discipline. Accordingly, the sciences form "a mosaic of partial and conflicting visions" (Freeman Dyson), and should not be viewed as a singleton that adds up to a unified world view. In the one end of the spectrum of the natural sciences, we find the nomothetic (law-oriented) sciences such as physics, chemistry and bio-chemistry; in the other end, we find historical and descriptive disciplines such as palaeontology and morphology.

However, due to the fundamental role of mathematics in the sciences ("compute what can be computed"), a certain priority is given to those sciences that are able to compress a wide range of data within a short formula: a 'pattern', a 'code', or a 'law'. The privileged status of physics and chemistry is provided by the fact these disciplines are both mathematical in nature and universal in scope. In another sense, however, the biological sciences are special by investigating the higher-level functions that emerge as a result of the concerted cooperation of highly complex organizations of the physical constituents.

Just as 'science' is a shorthand for the natural sciences in all their varieties, so is 'religion' a generic term for many divergent religions that cannot be unified within one overarching perspective. Universally accepted religions do not exist, but what exist are religions with universal truth claims. When speaking about religion in the following, reference is made particularly to monotheistic religions such as these are defined in the theological self-descriptions of, say, Judaism, Christianity and Islam in the West, and of Vedanta Hinduism and Taoism in the East.

In general, monotheism can be defined as the human search for finding – and being found by – God as the creative and meaning-giving Power in and above all that exists. As such, however, religion is never a theoretical search only, but is also a practice-oriented search for being attuned to God as the creative and meaning-giving Pattern of all-that-is (the world of actualities) and all-that-could-be (the world of potentialities).

No definition of religion can be completely neutral, and admittedly the definition above owes to the self-understanding of Christian faith: "In the beginning was the Pattern (Logos), and the Pattern was with God, and the

Pattern was God. It was in the beginning, and all things came into being with it, and without it not one thing came into being" (John 1: 1-3). Hopefully, however, the definition is wide enough to be useful as a provisional definition which has then to be re-specified from the perspective of each individual monotheistic religion.

2. Do you see any conflict between your definitions of these two concepts?

No, there is no conflict between these definitions of 'science' and 'religion'. Science inquires into the structures and processes of the world, and attempts to discern the recurrent patterns intrinsic to nature. Religion aims at discerning the creative and meaning-giving Pattern that creates, sustains, and renews all repetitive and provisional patterns of nature. Even though science and religion are concerned with different levels of reality, one might say that they are common in their search for pattern recognition. Similar to the way in which science 'discover' the laws of nature in data, do religious people look for the 'traces' of the reliable identity of God in the experiences of life.

3. Where do you think there may be a conflict between these two?

Conflicts may arise at two levels, either by 1. unjustified expansionist attitudes coming from science and/or religion, or by virtue of 2. conflicting metaphysical visions within science and religion respectively. See below.

4. What have been the grounds for the development of conflict between these two?

1. When sciences or religions transcend their respective limits, controversies are unavoidable. Religion expands its own proper boundaries, for example, if a religious belief system (backed up by powerful institutions in society) sets boundaries to the free exercise of science. The Galileo case in the beginning of the 17th century constitutes one famous example; but, up to this day, oppressive regimes continue to set limits to science. Also, conflicts arise if a religion affirms a very specific set of truth claims about nature that are at odds with those of current science. This is the case, for example, if religious people adhere to a literalist understanding of their holy scriptures, and use, for example, the Hebrew Bible as if it were a text-book in geology and palaeontology. Similarly, there is also a potential for conflict

when proponents of science claim to be in possession of definitive answers (positive or negative) to the religious quest for meaning and purpose, God and God's activity, or the ethical questions of value and disvalue, good and evil.

2. Whereas these conflicts are caused by the self-misunderstanding of science and religion respectively, there might be good reasons for metaphysical conflicts between a given religion and a particular research program within science. Science and religion are human activities that are not pursued independently of deep-seated world view assumptions. In so far as sciences and religions embody different ontological commitments as to the basic character of reality (world), conflicts are inescapable and should not be concealed.

After all, it is not quite easy to uphold a clear demarcation line between physics and metaphysics. For example, according to Issak Newton's (1642-1727) mechanical world picture as refined in the closed world view of Pierre Simon de Laplace (1749-1827), the World is a machine in which a mechanical order between material particles is ruling all over, without any conceivable exception. Although Christian theologians accepted this mechanical world picture within physics, its underlying metaphysical dimensions caused a real difficulty to many theologians. Admittedly, the world of mechanics was open for a religious interpretation in terms of God's universal providence. But how could one conceive of the unexpected features of reality (not to speak about 'miracles') within this world view? The religious experience of surprise appeared to be homeless in a mechanical world picture; in con- sequence, the religious sensibility appeared to be a mere subjective point of view, out of touch with the way the world 'really' is.

Of course, the world picture of physics is today no longer equal to that of Newton and Laplace. The clockwork image of cosmos has been replaced by a network image, according to which concepts of form, organization and information are seen as belonging to the heart of reality. These features cannot be deemed 'secondary' in relation to the constituents of matter. Quantum theory has radically removed what Paul Davies and John Gribbin has rightly called "the matter myth" of classical physics. Similarly, the sciences of complexity have reintroduced the sense of emergent properties as prominent features of nature – "the sciences of surprise", as the computer scientist John L. Casti has called them (in Complexification, 1994). The historical case of the mechanical world picture nonetheless shows us how scientific theories as well as religious beliefs are undergirded by metaphysical assumptions that may be at variance with one another. To be aware of such potential conflicts is, I believe, very important in the future dialogue between science and theology, and we need the help of philosophers to clarify and evaluate the metaphysical assumptions of both science and faith.

5. What has been the role of religion in the development of science in the West?

The historical interaction between science and religion in the West has many phases and many faces, and it is up to the professional historians of science to describe this extremely complicated and variegated relationship – from synthesis and cooperation to conflict.

On the whole, however, I do believe that the three Western religions have provided a fruitful intellectual atmosphere for the emergence of modern science. The creation accounts in the Jewish Bible (which are fundamental to both Christian belief and Islam) describe the world as marked by God's presence and surrounded by God's benevolence without itself being divine. As already pointed out by the German sociologist Max Weber (1864-1920), this desacralization of the world facilitates the scientific approach to the world. At the same time, the three religions of the book take a positive interest in this world as God's creation rather than fleeing into a spiritual reality behind the veil of appearances. This religious interest in the structures and processes of the world of nature might partly explain the fruitful beginnings of science within the Islamic world (esp. in the 9th to 13th century), followed by the flourishing of the classical sciences within Christian tradition in the period between the 13th and 17th century (see David C. Lindberg: The Beginnings of Western Science, 1992). One way to explain this situation, is to say that Western religious mentality has created and continually shaped the motivation for doing experimental science. In Christian tradition, we find the reference to the "two books" in which God has revealed Godself: the Bible and the 'Book of Nature' (see Olaf Pedersen: The Book of Nature, 1992). The scientific search for 'laws' and 'patterns' of nature has no doubt been propelled by the conviction that God has "set all things in order by measure and number and weight" (Wisdom of Salomon 11: 20). According to this view, nature is made for mathematical compressions. Moreover, since God is assumed still to be at work in the world of creation in ever new surprising ways, the laws of nature cannot be deduced from logical thinking alone, but needs independent investigation 'out there'. This sense for the contingency (non-necessity) of the world motivates an empirical research which transcends the boundaries of a mere philosophy of nature. The philosophical study of pure mathematics is not sufficient; needed is an inquiry into the mathematics which can be applied to empirical observations.

Apart from its role as initiating the scientific search for the contingent order of the universe, religion has also played a considerable role in interpreting the results of science. While science is usually not concerned with questions of meaning and value, scientific theories and world pictures are always interpreted within a wider cultural horizon which remains sensitive to the questions of cosmic purpose and human values.

6. Can we have a religious science?

In a strict sense, we neither should have nor could have a religious science. By virtue of the mathematical language of science, the sciences bracket questions of value and issues of meaning. This gives science the advantage of being cross-cultural in scope and not confined to a specific religious or secular culture. However, it also entails the danger of alienating science from other legitimate goals of human societies, including the attempt to understand the world under many different aspects – cognitive, ethical, aesthetical, and religious aspects– that transcend the narrow conceptual apparatus of the sciences, and to act in an appropriate way in order to fulfil the needs of humanity. Therefore, it is disadvantageous if scientists do not have any ethical or religious concerns beyond the scientific enterprise itself.

7. Can science dispense with religion?

Science certainly can and does dispense with religion in the sense that the scientific disciplines follow internal rational standards which should not be controlled by religious world views or other social powers. In another sense, however, science is part of cultural enterprise which is always larger than that of the sciences themselves. Thus, the practitioners of science cannot dispense with the religious search for ultimate reality, and for meaning and purpose of human existence, without dispensing with their own humanity. After all, the scientific enterprise is part of more encompassing cultural endeavors. Science starts out in a shared cultural field and remains embedded in commonly shared culture(s). Accordingly, science can be religiously (as well as anti-religiously) motivated and may be religiously (as well as anti-religiously) interpreted.

On this view, an 'Islamic science' or a 'Christian science' does not exist. What does exist, however, is science pursued in predominantly Islamic cultures or sciences exercised in a predominantly Christian context.

8. Can one separate the domains of activity of science and religion completely?

No, I don't think that we can have a complete dissociation between science and religion. Science and religion share the quality of being human activities within a shared cultural field undergirded by some strong or more loose assumptions of basic reality. Moreover, these activities often reside in the same human person.

Thus there is a pragmatic point of departure and a pragmatic point of return for both scientists and theologians. There is, however, an asymmetry to be noticed here. Since the scientific project is narrower than that of religion, excellent and most helpful science can be done under abstraction from imminent metaphysical and religious questions. However, since religion is finally about God as the ground of all-that-is and all-that-can-be ("Creator of Earth and Heavens"), any religion must be in touch with any description of reality that genuinely seeks to discover and uncover the structures and processes of God's work of creation. Accordingly, a theology (understood as a religion's self-reflection) should re-describe the world of nature (as already described and partially explained by the sciences) in terms of the belief in the one God: the creator, redeemer and fulfiller of all reality.

Prof. Andrei Grib

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Post-Doctoral Professional Experience: Chief of A.A. Friedmann Laboratory of Theoretical Physics; Head of Department of Mathematics, St. Petersburg University EF (St. Petersburg, Russia); professor of the department of theoretical physics and astronomy in Russian State Pedagpgical University.

Current Areas of Research: Elementary Particle Physics and Cosmology; Modern Physics and Orthodox Christian Theology.

Publications: Over 110 Scientific Papers and 8 Books on Elementary Particles, Big Bang, Properties of Quantum Vacuum and the Problem of Measurement in Quantum Physics.

1. What is your definition of science and of religion?

Science is getting systematic, step by step, knowledge of the surrounding world and of the human being.

Religion is getting knowledge of contacts with superhuman, transcendental to human being.

2. Do you see any conflict between your definitions of these two concepts?

I see no conflict between my definitions of these two concepts.

3. Where do you think there may be a conflict between these two?

A conflict between these two may be if science will neglect existence of superhuman, transcendent to human being, or if religion will praise as superhuman, transcendental, objects which in reality can be explained by science.

4. What have been the grounds for the development of conflict between these two?

The grounds for the development of conflict are in erroneous "deification of science" or in "idolatry-creating" in religion.

5. What has been the role of religion in the development of science in the West?

Religion as concentration on Ultimate Truth always played im- portant role for the development of science in the West, where due to Judeo-Christian tradition, the universe was always considered as different from God and immanent to man and woman investigation. "Be perfect as your Father is" means for Christians, that if our Father "knows" what is inside "supernovas", etc, we must also know it … .

6. Can we have a religious science?

Honest science is religious science. Science is the search for the hidden sense and unity of the universe. I agree with the words of the famous

German physicist H. Hertz who said after the discovery of Maxwell's equations: "We discovered the text, written by the hand of God!" Our goal as scientists is to discover such texts!

7. Can science dispense with religion?

Science and religion are necessary one to the other, but they can't mix.

8. Can one separate the domains of activity of science and religion completely?

One can't separate the domains of activity of science and religion, because the frontier between transcendental and immanent can't be defined by a human being and one must expect intersections between them, fruitful for the development of both.

Dr. Sergei Grib

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Education: A-level, English Grammar School (1961); State University of Leningrad, Faculty of Mathematics and Mechanics (1961-66); Ph.D. in Physics and Mathematics, Leningrad State University (1972).

Post-Doctoral Professional Experience: Lecturer of Mathematics at the Technical University of Leningrad (1984-85); Visiting Professor of Space Magnetohydrodynamics, Florence University, Italy (1990); Associate Professor at the Faculty of Applied Mathematics, Leningrad State University (1988-89); Astrophysical Department, Academy of Sciences (since 1989); Supervisor of the Solar Research Theme (since 1994). Giving lectures in High Religious-Philosophical School (1990-1992); President of Religious-Philosophical Society of Vl. Soloviev (since 1993); Winner of John Templeton Science-Religion Course Award (1997); Professor of Space Physics at the Pskov Polytechnical Institute (from 2003); a member of the International Astronomical union;

Current Areas of Research: MHD Theory of The Solar Corona; Solar Wind and Heliosphere; Geophysics and Gasdynamics; Leading Scientist and Convener of the Russian Project in the Studies of the Solar Wind (2003-2004); Science and Religion as the Fruits of the Revelation.

Publications: Over 110 scientific papers and communications, 20 papers on Religious Philosophy.

1. What is your definition of science and of religion?

Science is dealing with nature with the help of logics and instruments made by man. It is concerned with the creation and it studies the natural revelation.

Alternatively, religion is the reflection of the connection between God, creator, and his creation – human beings. It deals with the Divine revelation, given by God.

2. Do you see any conflict between your definitions of these two concepts?

There is no conflict between these two definitions.

3. Where do you think there may be a conflict between these two?

A conflict may appear when the boundary between science and religion is forgotten (as was the case in ancient Europe, in Nazi Germany and in Soviet Union).

4. What have been the grounds for the development of conflict between these two?

The grounds for the development of a conflict between them may exist among ignorant and fanatic people who are making idols either from religion or science.

5. What has been the role of religion in the development of science in the West?

The role of religion (or better to say of clergy) in the development of science in the West was sometimes helpful and sometimes hindering.

6. Can we have a religious science?

I think we can't have the religious science, because religion is accepted freely, unlike science.

7. Can science dispense with religion?

Science can't dispense with religion, because science is being made by human beings who cannot forget about religion.

8. Can one separate the domains of activity of science and religion completely?

It is impossible to separate the domains of activity of science and religion completely, though there is a definite boundary between these two.

It is as if religion is dealing with the third (vertical) dimension, whereas science is studying the properties of objects lying on a two-dimensions surface.

Science has no final verification and has the falsification being constantly active. In religion, we believe in Truth, revealed in God by God.

Prof. Nidhal Guessoum

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Education: B. Sc. in Physics (1982), University of Science & Technology, Algiers (Algeria); M. Sc. in Physics (1984) and Ph.D. in Astrophysics (1988), University of California, San Diego (USA).

Post-Doctoral Professional Experience: Associate Researcher / Post-Doc (1988-1990), NASA/Goddard Space Flight Center; Assistant Professor (1990-1994) and Associate Professor (1994), University of Blida (Algeria); Assistant Professor (1994-2000), College of Technological Studies (Kuwait); Assistant, then Associate, then Full Professor (2000-present), American University of Sharjah (UAE) and Physics Department Chair/Head. Has made 18 month-long research visits/stays at world-class research centers and participated in dozens of international conferences. Has lectured extensively in and outside the Arab world, including at prestigious universities such as Oxford and Cambridge (UK) and Cornell and Wisconsin (USA).

Publications: He authored/co-authored more than 60 research papers in Astrophysics, dozens of articles on Science, Education, Culture, and Islam, and several books, including: "*The Determination of Lunar Crescent Months and the Islamic Calendar*" (with M. Elatbi and K. Meziane, in Arabic: 1993 and 1997); "*The Story of the Universe*" (with J. Mimouni, in Arabic: 1998, 2002, 2006, 2007); "*Applications of Astronomical Calculations to Islamic Issues*" (edited with M. Odeh, in Arabic and English: 2007); "*Réconcilier l'Islam et la Science Moderne: l'esprit d'Averroès*", (in French : 2009) ; "Islam's Quantum Question: Reconciling Muslim Tradition and Modern Science" (in English, 2011); "Astronomy for the Islamic Society", (edited with M. Odeh, in Arabic and English, 2011).

1. What is your definition of science and religion?

Samir Okasha starts out his short "Philosophy of science" treatise with the following proposition: "Surely science is just the attempt to understand, explain, and predict the world we live in?"[1]

Ziauddin Sardar, implicitly restricting himself to the natural sciences, provides us with a more precise and complete definition of Science[2]: "[it is] an organized, systematic and disciplined mode of inquiry based on experimentation and empiricism that produces repeatable and applicable results universally, across all cultures." This has the virtue of emphasizing the goals of objectivity (repeatability, universality) and testability (experimentation, empiricism), two essential elements in the definition of "modern science".

The idea of testability, or "falsifiability" in Karl Popper's philosophy of science, is in my view critical to understanding what constitutes science in the modern sense: any hypothesis must lend itself to checking and verification, leading to confirmation or refutation, for it to even be considered a scientific hypothesis.

Religion is usually defined as a system of beliefs and practices that people subscribe to, whether freely or out of cultural belonging (most people are born in a given religious culture). I often emphasize the following important belief that most/all religions share: the existence of a spiritual dimension in humans, or more simply a "spirit" in each of us. Materialists and atheists reject this, though it must be noted that "atheism" is by definition the rejection of the existence of God, which is another common (but not systematic) feature of Religion (some religions insist on spirits but not on a god, at least not a unique God).

Then one needs to define both "spirit" and "God". God has many attributes that may constitute a definition of His being, but perhaps the essential one is that of creator (of everything). The spirit is an inner dimension of humans that makes them able to establish and experience a relation with God and His realm (angels and such, depending on the belief

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1. Samir Okasha, "Philosophy of science, a very short introduction", Oxford Univ. Press, Oxford, 2002, p. 1

2. Ziauddin Sardar, "Islamic science: the way ahead" (the text of a conference paper given in 1995), in "How do you know?", ed. Ehsan Masood, Pluto Press, London, 2006, p. 161

system).

2.Do you see any conflict between your definitions of these two concepts?

A number of thinkers have explored the relation (or possible relations) between science and religion; most notably, Ian Barbour proposed a famous four-type taxonomy: conflict, independence, dialogue, or integration.

It is important to note that since Modern Science has established "methodological naturalism" as a necessary principle of operation, namely that all scientific explanations of phenomena be formulated solely using natural causes (leaving aside all supernatural agents). If one accepts methodological naturalism, which all practicing scientists are obligated to but some philosophers (e.g. S. H. Nasr) have rejected, then relations between Science and Religion are somewhat constrained. They can be in "conflict" (see when and how in the sections below), or they can establish "(total) independence", working in separate realms of human interest. Conversely, "integration" becomes rather impossible, since some independence (due to naturalism) has been accepted, and one is left with "dialogue", where Science may be given the role of the explorer and discoverer and Religion plays the role of the wise old philosopher who puts the discoveries into a larger picture and explains "what it all means."

In terms of fields where Science and Religion have in recent times found fertile ground for "dialogue", one finds many publications addressing issues in the following four areas: cosmology (universe/multiverse, fine-tuning/anthropic-principle), biological and human evolution, physical reality (quantum uncertainty, entanglement, hidden reality, etc.), and neuroscience (the mind-body problem, free will, etc.).

In the Islamic culture, however, one finds the intersection of Science and Religion taking a different format. Indeed, the three large areas where the two find themselves mingling are: 1) the history of Islamic science (establishing who made what contribution, seeing what kind of science was practiced then, was it naturalistic or theistic, etc.); 2) the practical need for Science in Islam (astronomy for prayer and fasting times, most particularly); 3) conceptual issues such as the history and place of humankind on earth.

3. Where do you think that there may have been a conflict between the two?

4. What have been the grounds for the development of conflict between these two?

Conflict arises whenever science or religion trespasses its province of validity, as when scientists (Dawkins, Hawking) claim that their theories and results allow them to draw conclusions about (the non-existence of) God and (the non-validity of) religion, or when religious thinkers (Muslims in particular) make proclamations about what scientific results can or cannot be correct, e.g. biological evolution, purely on scriptural bases.

Confusion of the roles has often led to friction, as when scriptures are referred to with regard to scientific knowledge or practice or when science (or rather "scientism") starts to draw philosophical conclusions, on spiritual issues, on "scientific" bases.

5. What has been the role of religion in the development of science in the West?

This is an area of some contention, simply because it is very difficult to decide whether the fact that some key figures in the development of modern science (Newton, Faraday, Maxwell) were religious had any determining effect on their research or was simply incidental.

On another important level, several thinkers have recently argued that modern science, where the concepts of "laws of nature" is so central, could only have developed in a monotheistic culture like Europe and not, most particularly, in China where inventions were ingenious and widespread but fundamental science does not seem to have flourished. Indeed, they argue that the creation of the universe by a rational deity and the observed order and repeatability of natural phenomena led theistic (Christian) researchers to the concept of "laws" and thus to the inductive method and the scientific approach.

Interestingly, there does not seem to be any important case in history where aversion to religion is known to have led someone a significant scientific development. The famous case of Darwin, often cited as an atheist who tried to come up with a theory that would counter the prevailing argument from (divine) design, is an erroneous case. Darwin's biography shows no such ideological bent, and indeed he himself, though he came to reject the "religion" of his peers, remained uncertain (rather than unbelieving) about whether a divine inference could be made from what we observe in nature.

6. Can we have a religious science?

If we accept modern science's methodological naturalism principle, then by definition the *practice* of science cannot be religious or atheistic. In my book "*Islam's Quantum Question: reconciling Muslim tradition with modern science*" I argue that theism can only be an after-the fact interpretative layer, for believers whose worldview leads them to relate the scientific findings to divine creation, design, meaning, and purpose.

There are two important examples where a theistic worldview has been called upon to interpret scientific knowledge: a) biological evolution; b) cosmic fine-tuning.

The empirical data and the theoretical framework for biological evolution has led people to draw inferences ranging from materialism (atheism) to "Intelligent Design" and creationism (rejection of evolution); in the middle of this range, one finds "theistic evolution", whose proponents insist on the validity of the data and the theory underpinning biological and human evolution but give it a theistic interpretation.

Likewise, cosmic fine-tuning (the realization that most if not all the parameters and laws of nature have values and expressions without which complexity, life, intelligence and consciousness would not have arisen in the universe) has received a number of interpretations, ranging from divine creation and design to the multiverse (zillions of universes of all kinds, most of which sterile and meaningless, but one or a few being "good" for life, intelligence, and consciousness). Here too, the philosophical or religious inclinations of scientists and thinkers can lead them to favor one interpretation (of the fine-tuning data) over another.

7. Can science dispense with religion?

In its methodology and practice, certainly. Science has been doing this for centuries now.

In its vision and ethics, certainly not. Science does not have the philosophical capacity to regulate itself, hence the need for an ethical and guiding system, which does not necessarily have to come from religion but can very well be provided by religion if society wants it so.

8. Can one separate the domains of activity of science and religion completely?

In reality, no. When asked for a definition of Science, Rutherford (the discoverer of the atom's nucleus) is reported to have replied: "Science is what scientists do." And scientists, one must keep in mind, are human; they are affected by their cultural backgrounds, their personal inclinations, their own subjectivity, and their whims. Hence, even their practice of scientific research can be affected by their religiosity (or materialistic personal philosophy).

Science, however, one must stress, is a collective endeavor, and so personal inclinations get erased by the system through the peer review process and the repeatability and universality of the results. Still, as Kuhn showed, once a paradigm establishes itself, even the collective mind of scientists can become somewhat subjective – until some shift occurs on the basis of an important development that cannot be ignored.

So I am inclined to conclude that Science and Religion cannot be separated at the individual level, but they can and have been separated at the collective level, although sometimes the separation and objectivity is compromised – for a while.

Dr. Bruno Guiderdoni

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Educations: M.A. in Physics (1981) and Ph.D. in Astrophysics, University of Paris (1986).

Post-Doctoral Professional Experience: 2nd Class Research Associate at CNRS French National Center for Scientific Research) (1988), 1st Class Research Associate at CNRS (1992). From 1994, Director of the Islamic Institute for Advanced Studies (Embrun, France) ; Director of Research at CNRS (2002), Director of the Observatory of Lyon (2005-2015).

Publications: 170 scientific papers on observational cosmology and galaxy formation, 70 papers on Islamic theology and spirituality, interfaith dialog, science and religion interface.

1. What is your definition of science and of religion?

There have been many different definitions. For instance, one can argue that science answers the "how" questions, and religion the "why" questions, that science deals with "facts", and religion with "values", or that science approaches reality in an analytic way whereas religion approaches reality in a synthetic way. The Latin roots of "science" and "religion" respectively mean "to cut", and "to link". I am not fully satisfied with these definitions.

I believe that the ultimate difference deals with the issue of salvation. Science is the human endeavour to understand the world that extends around us. Knowing the world has transformed the way we live, but this did not make us be better persons. Religion is a divine message that has been granted to help man know God and prepare him to face God.

2. Do you see any conflict between your definitions of these two concepts?

As a Muslim, I do believe that knowledge can be unified because God is One. The fundamental tenet of Islam, at-tawhid, implies that all kinds of approaches to reality can be ultimately unified and get their final meaning in the contemplation of God's Face, in the Afterlife. So the conflicts only arise because of erroneous viewpoints on what science and religion actually are. Of course, this has been the case in the West since the end of the Middle Ages.

3. Where do you think there may be a conflict between these two?

Though there is no conflict between science and religion in principle, there has always been a tension, even in the Golden Ages of traditional civilizations. To give an example, I would like to mention the debate between al-Ghazali and Ibn Rushd (separated by almost a century) about the role and limits of reason in the quest for knowledge. They disagreed about the age of the world: Did God create an eternal world or a world with a finite age? My feelings is that this kind of tension is normal and can be solved not only with more scientific investigation, but also within a deeper metaphysical insight on what God wants to teach us in the Noble Koran. The process of knowledge accompanies us from our birth to our grave. Probably the final solution of the tension and paradoxes brought by the use of reason cannot be found in this life, but in the Afterlife, which is a wider world for knowledge.

4. What have been the grounds for the development of conflict between these two?

Tension does not mean conflict. Conflict appeared in the West, during the Renaissance, because at that time, Western thinkers and scientists began to think that reason had its foundations within itself, and without any reference to a transcendent Reality. Since that time, science in the West developed "against" religion, by pushing religion out of the quest for knowledge, because of the imperialistic behaviour of rationalism in the realm of knowledge.

5. What has been the role of religion in the development of science in the West?

Religion has always encouraged the quest for knowledge, including the discovery of the world that is God's creation given to Man. All religions emphasize that we have to look around us to see God's signs everywhere, because the world manifests God's Beauty and Majesty, Knowledge and Love. The regularities of the cosmos are a result of God's will. This is the teaching of the Noble Koran, as well as of the Torah and the Gospel. Once this has been said, I must add that, in the West, there is now the idea that Christianity is something special, and that God has achieved reason and freedom in Man only because of the event of Embodiment. According to this idea, Christianity has prepared the way to modern science that eventually appeared only in the West. This is a modern understanding of Christian theology. This was not the way Christian theology was understood in the Middle Ages.

6. Can we have a religious science?

The scientific activity is another way of worshipping God for people who are involved in the religious quest. They make "religious science".

7. Can science dispense with religion?

Science is only a process. Scientists are men and women who cannot dispense with religion. Their lifetime is finite, and they must fulfill their duty to accomplish their final destiny, that is knowing God. Scientists need salvation, as much as the other people. This is the meaning of the discussion between Ibn Rushd and Ibn Arabi. Let me quote the latter: "When I entered in upon [Ibn Rushd], he stood up in his place out of love and respect. He embraced me and said, 'Yes'. I said, 'Yes'. His joy increased because I had understood him. Then I realized why he had rejoiced at that, so I said, 'No'. His joy disappeared and his color changed, and he doubted what he possessed in himself. Then comes the explanation of these strange exchanges. Ibn Rushd asked the crucial question: 'How did you find the situation in unveiling and divine effusion? Is it what rational consideration gives to us?' Ibn Arabi replies, 'Yes and No. Between the yes and the no spirits fly from their matter and heads from their bodies'. And he reports on Ibn Rushd's reaction: His color turned pale and he began to tremble. He sat reciting, 'There is no power and no strength but in God', since he has understood my allusion". (English translation of the Futuhat al-Makkiyyah by W. Chittick, "The Sufi Path of Knowledge", SUNY) Ibn Arabi was alluding to salvation.

8. Can one separate the domains of activity of science and religion completely?

The domains should not be separated, but they should be seen as distinct types of activities. A Muslim astronomer that contemplates the sky admires God's creation. He has to use the reason that was given to him by God to worship God in this way, and be useful to mankind. After that, he goes to ritual prayer, and he also worships God in another way, that was also given by God through revelation. These are different activities. They should not be confused, but they cannot be completely separated, because man has to be one as God Himself is One.

Prof. M. Kamal Hassan

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Education: B.A. (Hons), First Class (Islamic Studies) (1966); M.A., Dept. of Near & Middle East Culture, Columbia University, New York (1970); M. Phil., Columbia Univ., N.Y. (1972); Ph.D. on "Contemporary Islamic Thought with Special Reference to Indonesia", Columbia Univ., N.Y. (1976).

Postgraduate Experiences: Head, Dept. of Theology, National University of Malaysia (1977-1978); Associate Professor at the National University of Malaysia (1980); Professor at International Islamic University of Malaysia (1983); Professor at National University of Malaysia (1986); Founding Dean, Kulliyyah of Islamic Revealed Knowledge and Human Sciences, International Islamic University, Malaysia (1990); Deputy Rector (Academic), International Islamic University, Malaysia (1990-1996); Visiting Professor and First Holder of Malaysia Chair of Islam in Southeast Asia at Georgetown University, Washington DC (January, 1997-December, 1998); Currently Rector, International Islamic University, Malaysia, as of 5th April 1999.

Selected Publications: *Muslim Intellectual Responses to "New Order" Modernization in Indonesia* (1982); *The Muslim Concept of 'Ubudiyyah* (1982); *Education and Development: An Integrated Perspective* (in Malay, 1988); *Moral and Ethical Issues in Human Resource Development: Old Problems and New Challenges* (1994); *Towards Actualizing Islamic Moral and Educational Values in Contemporary Malaysian Society: Some Critical Perspectives* (Kuala Lumpur: ABIM, 1996).

1. What is your definition of science and of religion?

Definition of science:

A systematic knowledge or study or inquiry of the physical or material world gained through rational observation and experimentation with a high degree of objectivity. This definition embraces all the exact sciences, physical sciences and natural sciences. However, the study of human behaviour, as individuals or in groups, comes under the purview of social or human sciences. This branch of science is highly problematic because it is usually value-loaded and often influenced by the philosophical and/or ideological assumptions of the researcher.

Definition of religion:

A set of beliefs and practices constituting a particular way of life, which springs from the fundamental belief in God or a suprahuman agency, power, being or intelligence, which created the universe and serves as man's highest object of worship, devotion and obedience. A religion is described as "revealed" when it is based upon God's revelation as contained in a Scripture or Book. A religion based upon human reason or the worship of other than God, including forces of nature is regarded, from the perspective of revealed religion such as Islam, as deviating from the truth. The highest and truest form of religion is one that asserts the absolute otherness and uncompromising oneness of God who is not only The Creator but also the only Lord and Sustainer of the universe.

2. Do you see any conflict between your definitions of these two concepts?

No conflict in the definitions.

3. Where do you think there may be a conflict between these two?

A conflict may occur when religious beliefs are found to be in contradiction with the established facts or findings of science or when science makes judgement on matters which are metaphysical in nature or beyond the scope of human reason. As a matter of fact, true science and true religion are complementary.

4. What have been the grounds for the development of conflict between these two?

The grounds for the development of conflict are usually:

a) Illogical religious or church dogmas.

b) Superstition parading as truth.

c) Vested interest of religious elites.

d) Vested interest of ruling elites which supported a particular religious doctrine or scientific viewpoint for their own self-preservation.

e) Atheistic philosophy or worldviews of science.

f) Secularistic or materialistic philosophies of science.

5. What has been the role of religion in the development of science in the West?

The development of science in the West has been largely at the expense of traditional religions, i.e. Christianity and Judaism. The birth of modern science which is essentially secularistic in nature was a form of liberation from the control of Church dogmas and irrational beliefs.

6. Can we have a religious science?

If by "religious science", we mean science which is grounded in the belief in One God, the harmony of revelation and reason, creation *ex nihilo* and the existence of physical laws ordained by God, then there can be a "religious science". Such a science recognizes the limits of human reason and the inexorable wisdom and will of God. The application of scientific knowledge and technology would thus be circumscribed by what revealed religion considers proper, useful and wholesome.

7. Can science dispense with religion?

Science, in essence, will be in harmony with the true religion of absolute monotheism. It ought to dispense with false religion or deviant religious or spiritual beliefs. It, however, needs the guidance of true religion to maintain its value orientation and spiritually-based ethics to contain its destructive potential or misuse by secular or atheistic scientists. However, in areas of research which are value-free, science can be independent of religious beliefs.

8. Can one separate the domains of activity of science and religion completely?

From the point of view of revealed religion, in particular that of Islam, the domains of activity of science are considered aspects of "worship" (*'ibadah*) of God insofar as those activities are not in conflict with religious beliefs or laws (*sharī'ah*). Even the physical objects of scientific research are considered as "signs of God" *(ayatullah)* and the useful products of such activity as "virtuous deeds" *('amāl āliyah)*. While the domains of scientific activity do not fall strictly into the narrow definition of "religion" as man's private relationship with the Divine, they are still relevant to the ends of revealed religion and are directly related to the values of such religion, if not to rituals *per se*. In this respect, it is possible to have a good scientist and a pious religious personality embodied in one person. Islamic history is full of such examples.

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Publications: He is a prolific author and has more than 70 books and treatises in Persian and Arabic to his credit.

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[1] Allamah Hassan-Zādeh Amolī's presentation was in Persian. It was translated into English by Professor Gholam-Reza A'awānī. We thank Prof. A'awānī for his contribution.

1. What is your definition of science and of religion?

Science, in the real sense of the word, is true knowledge of the author of the book of existence and the ontological words contained in this book, as far as it is possible for human beings. Knowledge in itself, is a kind of luminous being and an actuality, free from potentiality and materiality. Man perfects, himself and ascends the ladder of existence and adds actuality to actuality by realizing in himself this light until in the end he becomes a luminous being. As the famous Persian poet, Manouchehrī Dāmaghānī has eloquently said:

> *It is like a half-lit dying-out lantern*
> *Whose oil increases hour by hour*

Since knowledge and action are the two substances making the reality of man, in whom both as knower and as actor, the two substances are unified, in the "divine science", it is well said that "man through learning wisdom – which is none other than the acquisition of knowledge and due action – becomes an intelligible world like unto the objective world of reality".

True science is the eye by which the rational soul of man perceives reality and by whose light discriminates between truth and error, and attains to the eternal bliss, wherefore the Messenger of God, Muhammad the last among prophets – upon whom be the blessings and the benedictions of God – has said:

> *"science is the guide of action"*

Religion, however, can be defined as the true discipline and the real injunctions which safeguard the humanity of man and guide him to felicity and eternal happiness. All the rules and texts of religion are in accord with the sacred science and are, in the true sense of the word, real. Hence only God, the creator and the author of human beings, is alone capable of compiling such a discipline. The same pen and the same hand which have written this Cosmological Book and have existentiated this inconceivably great and majestic order with unsurpassable beauty in which each ontological word has its proper function and in which there is not the least iota of deviation, discrepancy, inadequacy and disorder, the same pen has foreseen and provided for the needs of His grand creature called man, with sheer wisdom, so as to lead him to his ultimate goal and final perfection. Such a discipline foreordained by the absolute wisdom of God, we call religion.

It is most proper here to present to our dear readers a precious gem from the utterances of the Messenger of God, who said:

> *"Verily this Holy Qur'an is the banquet of God, so learn the manners of this banquet as far as you can."*

The Holy Qur'an has been revealed in order to cultivate the spirit of man and to rectify him. So the above utterance of the Holy Prophet means that the Holy Qur'an is the book of divine discipline and decorum by which man safeguards his humanity and by a right and righteous upbringing realizes his Divine nature. So the above statement means that the Holy Qur'an is the handbook of Divine decorum and the command of God: Learn decorum from this Divine Book and keep to the limits of your humanity and by following the Divine commands, rectify yourselves and realize in yourselves the God-given potentialities. Again, the Holy Prophet said: "My Lord has taken upon himself my refinement and how well He has refined me". Again, he is reported to have said: "My Lord cultivated in me the noblest moral qualities".

2. Do you see any conflict between your definitions of these two concepts?

Science, in general, and Divine science in particular, is like a beam of light which is identical with the reality of him who possesses that science and illuminates his being and enables him to see the path ahead. Sages have rightly said that science and the possessor of it are not two things but the one is identical with the other. The Holy Prophet – upon whom be the benedictions of God – said: "Science is identical with the intellect, and the spirit of them both is right understanding". Religion always induces one to acquire such a luminous knowledge and considers one's rank in the hierarchy of being and perfection to be the same as his rank in knowledge; because no religious injunction is conceivable without rational justification, wisdom and some kind of benefit for the ideal human commonwealth on the one hand and the perfection and felicity of the individual human being on the other. Most experts in the science of religion have written monographs on the mysteries of the religious injunctions such as "The mysteries of prayer", "The mysteries of fasting", "The mysteries of the Holy Pilgrimage" and so on.

In the Holy Qur'an, the last among the divine scriptures, we read: "These parables we cite for common people, but none save the people of science comprehended them". In this verse, "the people of science" are distinguished and set against the "common people". The "common people" is a reference to the "multitude" and the "rabble of mankind" and "the people of science" is a reference to those who have attained to the peak of absolute science; they are those who possess the intelligence and are able to intelligize the nature of things. This means that parables have both a shell and a kernel. The shell is meant for the common people who are not well-trained in the intellectual and scientific discipline and are not able to fathom the Divine mysteries. The kernel is meant for the "people of science" who through intellectual training and scientific discipline are able to penetrate from the outward to the inner reality of things. Molavī [*Rumi*], the famous Persian poet, referring to the above Qur'anic verse, says:

> *O brother, the parable is as a corn measure*
> *In which the meaning is hidden as grains*
> *Seize the grain of meaning, O man of intelligence*
> *Do not heed the measure if it changes into another*

The last of Messengers, Prophet Muhammad, upon whom be the blessings of God, in the following tradition has considered paradise to be the real wisdom: "I am the city of wisdom–which is the paradise–and you are–O Ali–its gate". In summary, science and religion not only are not in conflict, but being of the same substance and origin, corroborate each other.

3. Where do you think there may be a conflict between these two?

It is possible that a certain science which is of no avail, neither in the context of human life and civilization, nor of any significance in the knowledge of the mysteries of religion and which might cause the perdition of mankind or harm his eternal bliss, be rejected by divine religion, as are certain kinds of food and drink like eating carrion, and drinking intoxicants which are prohibited in the Islamic Law.

4. What have been the grounds for the development of conflict between these two?

This question can be answered from two points of view.

The first viewpoint is somewhat similar to our answer to the question number 3.

The second aspect of the question is that in the past, a certain group of people known in the traditional sources as *Ashāb al-ma'ārif* "people of learning" believed wrongly that there is no need for revelation, prophecy and the Divine Law. They argued that the statements of the claimer to prophecy were either in accord with reason or not. If they were in conflict with the grounds of reason, they could not be accepted and if the tenets of faith and revelation were in accord with the exigencies of reason, so they would be superfluous and redundant, reason being the supreme judge and arbiter: so they argued that there is no need at all for prophecy and revelation.

But such a way of reasoning is in fact erroneous and extremely weak. It is only a pretext for shirking one's responsibilities, for human reason as such is incapable of comprehending the true essence of things which is necessary for positing laws which would ensure man's happiness. Only the inner logic of revelation can undertake legislature for man. Of course, after the appearance of a divine revelation we come to know about the mysteries hidden in it, which could not be known prior to revelation. This problem is discussed in minute details in theological texts.

Here it must be pointed out that the term "people of learning" is not used here in a literal, technical sense, but on the contrary it was adapted in the Traditional sources to refer to a special group of people who denied the institution of revelation and prophecy, and who believed that reason was autonomous in discovering and interpreting the laws related to this life and the hereafter. In the famous exegete of the Qur'an, Tabarsī in his *Majma'al-Bayān* while commenting on the verse 103 of the second chapter: "And if they believed and feared God, a recompense from God would be better for them, if only they knew", says:

> *"In this verse, there is a manifest refutation of the opinion of the "people of learning" because God, the Almighty, denied them such knowledge".*

5. What has been the role of religion in the development of science in the Islamic civilization and in the West?

There is no doubt that the emergence of the great civilization of Islam had a great impact upon the progress of science, with all its ramifications, in the Western civilization. This is a point which cannot be denied by any scholar well-versed in the subject. Many books and articles have been written in this regard of which I quote two passages. The first one is by Alfred Guillaume in his introduction to the book *Heritage of Islam* compiled by thirteen famous

Islamologists, published by the Oxford University Press and translated into Persian by Mustafā Alam and Sa'aīd Nafīsī. He says:

> *"The Heritage of Islam seeks those European scientific, industrial, cultural and spiritual factors which are taken from the Islamic world and derived from the Eastern Arab Lands.... It is Islam and the grand Islamic Empire which have combined the sciences and crafts of various lands and have introduced them perfectly and beautifully to the world of science and industry".*

There are several other sincere remarks by the same authors in the mentioned book.

The second book is entitled *The Islamic Sciences and Their Impact on the World Scientific Evolution* translated into Persian by Messrs. Muhammad Rezā Razavī and Asadullāh 'Alavī and published by Āstān Quds Research Foundation. Moreover many other books and articles, such as those mentioned above, were written by those who were both experts of science and adepts of contemplation and spiritual realization. I would like, to quote, as an example, a few lines from "The Impact of Qur'an on the Rise of the Islamic Civilization" written by my beloved master, the late 'Allāmah Sha'arānī, May God have mercy on him!

> *"Those who have studied history and are well aware of the story of the ancient civilizations know well that until the rise of the Greek civilization, no nation reached the high peaks of science among the ancients and no nation was as able to attain the acme of culture and civilization. Those, moreover, who were before the Greeks were lower than them in rank in this regard. A short while before Alexander the Great philosophers and scientists proliferated and there appeared among them such great luminaries as Plato and Aristotle. After the world conquests and the hegemony of Alexander the Great, Greek science and language disseminated in the Hellenized world, such that they became world-wide for a thousand years and Greek became the language of both science and religion. Even the followers of Jesus Christ wrote the Gospels in Greek. The word Injīl (Evangels) in Arabic, itself is derived from the Greek word Evangelion meaning the good tidings. This, not-withstanding the fact that Jesus Christ was not Greek, nor did he belong to the Hellenic or Hellenistic culture, since he spoke the Aramaic which is an offshoot of the Hebrew language.*

Almost a thousand years after Alexander the Great, there appeared Muhammad Ībn Abdullāh, the last among the cycle of prophets, upon whom be the blessings and the benedictions of God. The Holy Qur'an was revealed to him in Arabic and henceforward Arabic superseded Greek as the language of science and even surpassed it in scope. Muslims adopted the Greek sciences. In their hands, the sciences proliferated and multiplied as much as many times. Arabic for many centuries became the language of science and achieved a high status and sciences were written in this language which had never been written in any other language before.

In history books, it is recorded that the library of Alexandria in Egypt, which was one of the largest libraries in the ancient world, contained only 25,000 books in Greek sciences, but in the Islamic era, the number of books in Islamic sciences in huge libraries outnumbered a million.

Jorjī Zaydān, in his History of Islamic Civilization and also in his History of Arabic Literature says that, two Fatimid caliphs of Egypt called Aziz billah (365-386 A.H.) and Hākim bi Amrillāh (386-411 A.H.) set up libraries in Egypt, which shelved over one million books, that is forty times as many as the books of the Greek library of Alexandria. Again, he remarks that there were many great libraries in Egypt, Iraq, and Andalusia (Islamic Spain), each containing hundred thousands of books and they were all open to the public. So we can surmise that the books written in Arabic science were at least forty times as many as those written in Greek.

Greeks, no doubt had compiled books in literature, ethics, rhetoric, the science of law and jurisprudence, politics, history and geography, but without doubt, from the point of view of quantity, quality, depth and precision of research, they were not comparable to those written in Arabic. In mathematics, particularly in arithmetic, algebra, trigonometry, algorithm and astronomy, Muslims far surpassed the Greeks. These accomplishments were all due to the blessings of the Holy Qur'an. What we say is not an exaggeration and the history of science is our best witness. Since in the Holy Qur'an, Muslims were enjoined to perform their ritual prayers five times a day, they had to acquire the knowledge of the time and the direction of the prayer, so in order to determine the precise direction of Mecca (qīblah) and also the times of the prayers, they were in urgent need of the science of astronomy, which again obliged them to learn the other

> *branches of mathematics. The laws of inheritance and the distribution of shares among legal heirs is a very complicated affair in Islamic Jurisprudence and made Muslims to learn advanced arithmetic. In order to determine the rate of the alms-tax and taxation duties and to calculate the areas of their lands, they again needed arithmetic. Engagement in Holy wars and performing the Holy pilgrimage, taught Muslims the science of seafaring and exploration and they came to know about the circumstances of other nations and countries and so they started to compile works on geography and so on.*
>
> *Islam has emphatically prohibited Muslims from imitating their forefathers and ancestors and has invited all believers to true faith through rational investigation and has made knowledge about the articles of faith by means of rational analysis incumbent on all Muslims. The opponents of Islam and the detractors of religion were in constant debate with the Muslims who had to refute their opponents on the basis of argumentation and rational demonstration. Hence, they came to discover the philosophical views of Greek philosophers and the sages of other nations, from whom they learned the science of logic and the art and methods of reasoning. So, on a careful analysis, one can see that Muslims learned all these sciences in the light and through the blessings of the Holy Qur'an ... Thus we can conclude that the Modern Western science and civilization are the continuation and protraction of Islamic sciences, rather than being derived from Christianity".*

This was a summarized account of the words of my master, the late ʿAllāmah Shaʿarānī – May God illuminate his proofs – taken from his book *The Path of Happiness.*

6. Can we have a religious science?

The question as I understand it is as follows: Are human beings as such able, by themselves, to unveil the mysteries of the Divine laws and the injunctions of the Divine religions or not?

Answering this question, we say: As the Great book of Existence – that is the ontological order – is laid on the foundation of knowledge and wisdom, as the very word *ʿālam* (the world) in Arabic signifies, being derived from the root *ʿIlm* (Knowledge) and so meaning the piled-up knowledge, so also the

Holy Written Scripture, i.e. the Holy Qur'an is similar to the Book of Existence, that is, it is mere knowledge and sheer truth and wisdom.

For instance, all the obligatory rules in religion are to the benefit and advantage of believers and all the prohibitions on the contrary are to their detriment and disadvantage. All the rules of religion as recorded in the books of Islamic jurisprudence, beginning with the book of purification and ending with the book of indemnity and blood-money are based on rational causes, and justifications.

The Islamic law, for example, has not prohibited the eating of the sour grapes and its juice, grapes, grape juice, vinegar and raisins, but has prohibited the drinking of wine, because of the evils and harms which it incurs. In the Holy Qur'an, we read: "O believers, wine and arrow-shuffling for idols and divining-arrows are filthy and abominable and part of Satan's work, so avoid them so that you may be saved. Satan only desires to precipitate enmity and hatred among you in regard to wine and arrow-shuffling and to deter you from the remembrance of God and from prayer, so will you not desist?" (Qur'an, chapter 5, verses 93 and 94).

Our compendia of Holy Traditions which are among the best of our spiritual heritage handed down to us from the Household of Revelation and Inerrancy and which are in reality the best commentary ever written on the Holy Qur'an based on the highest spiritual realization, reveal to us many mysteries and secrets of the Divine laws, injunctions and prohibitions and contain many allusions which are the stock-in-trade of any searcher after truth. Among such books, one can mention *'Ilal ash-Sharāye'a* (The Justificatory Causes of the Divine Laws) and *Ma'āni al-Akhbār* (the Meaning of the Holy Traditions) compiled by the eminent Shi'ite scholar Sheikh Sadouq, the latter book containing 426 chapters, from which I quote one or two examples:

The first Shi'ite Imam, The commander of the faithful, 'Alī ibn Abī Tālib, expounding on of the mysteries of the Book of, Existence is reported to have said: "There is no living creature with non-protruding (hidden) ears, except that it is oviparous (egg-laying) and no one with protruding ears (literally apparent) except that it is viviparous (i.e. bears children).

So snakes, lizards, fish, eels and turtles and most of the birds whose ears are not protruding and have no auricles are oviparous that is, they produce their young by hatching, whereas human beings, deer, horses, lions and bats, with protuberant ears and auricles bear children.

Let me here mention a noble lady who was both a writer and great scholar, with an admirable single-mindedness and talent who made some research about this matter. The learned Qajar prince Farhād Mīrzā in his distinguished book *Zanbīl* says:

> *"Amir Kamāl-ad-Din Hossein Fanā'i is reported to have said: The sixth Shi'ite Imam Ja'afar as-Sādīq one day asked the lady Umm-i-Jabir as to what she was doing. She answered that she was busy finding out among the living creatures which ones laid eggs and which ones gave birth. He said that would not need much thinking because those with prominent ears procreate and those otherwise lay eggs: "That is the ordaining of the Almighty, the All-Knowing." (Qur'an, 6:96). So hawks which are birds with non-protuberant ears lay eggs: the turtle which is a grazing animal with the same qualifications again lays eggs but the bat which is a bird with protuberant ears begets".*

It must be pointed out that Avicenna in the first article of *De Animalium Partibus* of his book *Shifā* (Translated into Latin as *Sufficientia*) in the beginning of chapter five says:

> *"Among the bipeds, only human beings procreate"*

He means that all bipeds except human beings lay eggs. We should add here that Avicenna's statement is not quite correct as bats and vampires, which are bipeds procreate rather than lay eggs. However our quotation from Imam Ja'afar as-Sādīq is completely and perfectly correct.

What we said, was only an example of the mysteries of the Book of Existence. Let us return to another example, this time chosen from the mysteries of religious laws. One of the Inerrant Imams was once asked: "If one finds an egg in the woods, how does one know whether it is ritually lawful to eat that egg or not." Where-upon the Imam answered: "every egg with two identical even ends is ritually unclean and eating it is prohibited, but if only one side is even as in the egg of a hen, it is ritually clean and eating it is commendable.

Fayd Kāshānī, the famous Shi'ite scholar, traditionist and jurisprudent quotes several traditions regarding this issue in the eleventh chapter of his *Wāfī* (*Rahli* edition, vol. 3. p. 15).

A snake-egg, for example, is oblong and its two sides are equally even. The egg of a tortoise is round and so equally even from every side and hence both of them are ritually unlawful to eat. The eggs of partridges, doves, sparrows and hens, on the other hand, are conic in shape, one side being even and the other side elongated and hence ritually clean to eat.

Food-discriminating and ritually-clean-eating birds have wholly conical eggs. Some ritually clean birds, such as ducks, eat slime and worms, so their eggs, even if conic in shape, are not as perfectly conical as the food-discriminating birds.

So in answer to your question, "Is such a thing as religious science possible?", I would briefly say that even if there has been much wrangling concerning such problems in Islamic Jurisprudence, but it is an indisputable fact that all religious laws are based upon cosmo-ontological causes which are alluded to in our compendia of Holy Traditions. And also in the books written by our religious scholars, many mysteries of the Divine law are divulged, most of which are commendable and which can be used as guideposts for further inquiry. So religion has never been a hindrance on the way of scientific investigation and research, but on the contrary it has always encouraged and persuaded believers to pursue this enterprise. For example, in Turayhi's *Majm'a-al-Bahrain*, under the Arabic root-stem far' (فرع) the following Holy Tradition is quoted from.

Imam Muhammad Baqir and Imam Ja'afar as-Sādīq, the fifth and the sixth Shi'ite Imams: "It is incumbent on us to insinuate to you the principles and it is incumbent on you to deduce the ramifications."

In the authentic Islamic mystical writings such as *Mīsbāh al-uns* by al-Fanārī it is explicitly stated that the Injunctions of the Divine law all derive from the ontological context of reality. In the beautiful words of Avicenna in *Dānesh Nāmeh 'Ala'ī*, "To each and every thing unknown there is a path through which it becomes known."

7. Can science dispense with religion?

Certain sciences such as those concerned with crafts and professions and connected with the comfort and the welfare of human life are, so to say, independent of religions, unless they are taken into consideration from the point of view of ritual purity or impurity, licitness or illicitness, or with respect to the intentions and aims for which they are performed. In any case, the Holy Qur'an is the basis for the perfection and the eternal happiness of human life; it preserves the humanity of man and safeguards his eternal bliss. Therefore man, whatever his social status or profession, is in need of it and cannot dispense with it.

8. Can one separate the domains of activity of science and religion completely?

As explained in our answer to the question number one, the luminous religion of Islam is in accord with sheer knowledge and is the Right Path. The Holy Qur'an is the logic of God and also the last word of God. Its other name is Furqan which means "that which distinguishes truth from error". A perfect savant in religion is one who knows perfectly well all the sciences which in one way or another are related to religion as is witnessed and well testified by the life and works of the great scholars of religion. The sciences which are essential for the scholars of religion to know are well indicated in their works.

Islam is not opposed to the sciences and crafts which cause the advancement of the perfect human social and political life and improve his welfare and means of livelihood but supports and encourages them. Fārābī's *al-Madinah al-Fadilah* and the other works written by Muslim sages are the best evidence for the matter. Even to talk about the separation of religion and science is a vain idea and an idle talk.

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1. What is your definition of science and of religion?

Science is one of many ways of knowing. I understand its method to be one that looks especially for the physical causes of events (material and efficient causes) and expresses them as much as possible in mathematical terms. Science seeks quantitative knowledge of recurrent natural routines on the basis of which it then seeks to make predictions useful for engineering and other purposes. In doing so, it deliberately leaves out any adequate consideration of value, purpose, God, meaning, novelty and subjectivity. Religion, on the other hand, is concerned with ultimate explanations and the meaning of events in terms of their first and final causes. In the broadest sense, religion is devotion to whatever one takes to be of ultimate importance. Less broadly speaking, religion is the cultivation of a sense of mystery that transcends the knowable world. Albert Einstein was a "religious" man in these first two senses of the term. However, religion in a third sense typically means belief in a personal God (as in Judaism, Christianity and Islam). It is especially this third understanding of religion that seems to Einstein and many other scientific thinkers to conflict with science.

2. Do you see any conflict between your definitions of these two concepts?

Personally I see no conflict between science and religion in any of the three senses listed above. But the idea of a personal, responsive God inevitably seems to conflict with the scientific expectation, expressed by Einstein, that nature's lawful habits are absolutely inviolable. Even scientific naturalists can be called "religious" in the sense of having an ultimate concern (for example science itself); and many nontheists are "religious" in their appreciation of the aura of mystery in which nature is embedded. However, the idea of an interested, active God is difficult for many scientific thinkers to coordinate with their assumption that natural causes are sufficient to account for all events, including the emergence of life and mind in evolution. I believe that if theology is done carefully, there is no need for this sense that science is incompatible with belief in a personal God.

3. Where do you think there may be a conflict between these two?

The conflict is not between science as such and religion. Rather the conflict is between scientific naturalism, the belief that "nature is all there is", on the one hand, and certain religious ideas on the other. So the conflict lies between irreconcilable beliefs rather than between science and religion.

4. What have been the grounds for the development of conflict between these two?

The roots of the conflict seem to me often to lie in simple ignorance of both science and religion by the various parties, especially today with respect to evolution. However, at times the alleged incompatibility lies more fundamentally in a conflict between the humble desire to know truth on the one hand, and the human will to power or obsession with certitude and cognitional mastery of the world on the other. Both scientists and religious people can succumb to the impulse to control their respective worlds. Ideally, both science and religion flow forth from the pure desire to know; but, in the actual world, this desire is often diverted by other powerful desires that have no interest in truth. In this sense, the question of science and religion is inseparable from the deeper problem of evil and the human heart.

5. What has been the role of religion in the development of science in the West?

Most fundamentally, the persistent theistic belief in the intelligibility of the universe has prepared the soil for science which, as Einstein, Charles Townes and others have noted, cannot even get off the ground without a tacit faith in the underlying rationality resident in the "book of nature". Although Einstein himself had no answer to the puzzle of nature's inherent intelligibility, theology has always been convinced that only an eminent Divine intelligence can satisfactorily ground the possibility of science. At the same time, however, theology's encounter with evolutionary biology has chastened any of our presumptions that we can ever clearly discern the precise nature of Divine intelligence.

6. Can we have a religious science?

I prefer, for the sake of the science and religion dialogue, to avoid this expression. Science methodologically brackets any formal discussion of religious concerns. What science leaves out, can be investigated by a richer empiricism than that practiced by normal science, but science itself should avoid the adjective "religious". To speak of a "religious science" will sound suspiciously conflationist to many scientists. At one level, therefore, science should be carefully distinguished from religion. However, as Michael Polanyi and others have argued, at a deeper level there are personal commitments that energize scientific inquiry, and these are undeniably religious, at least in the first of the three senses of religion mentioned above. Genuine science is impossible without a passionate devotion to such virtues as humility, courage, integrity, selflessness, and the love of truth. While religion is not identical with these virtues, it can provide plausible answers to the question as to why we should wish to be virtuous at all. So while science is logically distinct from religion, it is existentially inseparable from it.

7. Can science dispense with religion?

Because of the basic trust in reality and its intelligibility, a trust essential to scientific work, I believe that at some level the scientist must make a tacit act of surrender to ultimate reality. Being or reality grasps hold of the inquiring mind, usually in so quiet and unobtrusive way as to escape conscious awareness. I believe that every good scientist has in some sense already been grasped by truth, goodness and beauty even before formal inquiry commences. Religion, as Paul Tillich has noted, is a state, not of grasping the ultimate, but of "being grasped by" the ultimate. In this sense, science cannot dispense with religion. However, the actual experiments undertaken by science should never attempt to introduce religious ideas and explanations at the level of scientific inquiry. This insertion would not only compromise the autonomy of science, but, even worse, end up trivializing religion by placing it in the same cognitional context as mundane scientific work.

8. Can one separate the domains of activity of science and religion completely?

Even though science and religion must be carefully distinguished, they can still constitute a differentiated unity. As Teilhard de Chardin emphasizes, true union differentiates, and this can apply to the relationship of science to religion. What must be avoided, is any expectation that religion can do the work of science or that science can answer religious questions. However, since reality is such that many levels of explanation are necessary to an adequate understanding of it, scientific and religious explanations can coexist comfortably in functional complementarity with one another. In such a setting, theology can encourage scientists to push naturalistic inquiry as far as possible since its own kind of inquiry inhabits a distinct level of inquiry. Simultaneously, the careful scientist will avoid turning scientific explanations into ultimate explanations, since this would amount to a transformation of science into an alternative religious worldview.

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1. What is your definition of science and of religion?

The term "science" to me refers to knowledge about the natural world, and it can be characterized in terms of both method and content. By the content of science I mean the knowledge embodied in disciplines which are classified as 'natural science' such as physics, chemistry, biology, astronomy etc. and also those classified as 'social science' such as economics and sociology. I admit that this is not an 'essentialist definition' which would suggest that there is something 'essential' in the content of science which naturally demarcates it from the 'non-sciences' such as literature, history or religious studies. But the subject matter of the sciences, which is the natural world, would sufficiently distinguish it from the non-sciences.

Despite the variation in the content of science, there are certain methodological features which qualify them to be labeled as 'science', Feyerabend's protestations notwithstanding. Thus even though the content of 'physics' – which refers to knowledge of the behavior of physical objects –and the content of 'economics' - which refers to knowledge of the production and distribution of material goods and services- are different, yet the method by which such knowledge are produced and validated possess certain similarities. For example, they are expressed in terms of quantitative mathematical laws, involves mathematical modeling and verification of those models though empirical evidence.

'Religion' on the other hand involves both knowledge and practice, in which the social and individual practices associated with religion, are based on religious knowledge which is accepted on faith by believers. That Divine knowledge, which constitutes the foundation of religion, is revealed to God's messengers who then transmitted them to the followers of the Religion concerned. The content of that religious knowledge vary from one religion to another, although there might be some similarities as in the case of the Abrahamic religions. Religion involves not only doctrines and beliefs, but also a set of practices and rituals based on those beliefs.

2. Do you see any conflicts between your definitions of these two concepts?

According to the way I have defined them, there need not necessarily be any conflict between them, just as how there is no conflict between the different branches of natural science because they refer to different domains of (physical) reality- i.e. the physical, the chemical and the biological. Religious knowledge being knowledge attained by the Prophets through Revelation cannot be subjected to the same epistemological standard which is applied to the natural sciences. Religious knowledge does not claim legitimacy or validity by appeal to rational or empirical means. Since God himself created the 'rational' and the 'empirical', the knowledge which he revealed cannot therefore be constricted by those criteria. Furthermore, religion is also about values, moral, ethics and codes of conduct, i.e. it teaches us how to lead the virtuous life so as to gain the Hereafter and to be close to God (except for Buddhism). Science, on the other hand, dealing strictly with the natural (and not the 'human') world, in a supposedly objective and value-neutral manner, cannot therefore have anything to say on the matter, and therefore incapable of making any claims- conflicting or otherwise- about how to lead the virtuous life. But even when there is a potential conflict between them, as when they make claims about the same domain, such as the cosmos or the natural world for example, they cannot be judged by the same standards because they contain different metaphysical assumptions and different epistemological notions. These assumptions and notions should be treated 'symmetrically' so that the burden of proof does fall on only one of them. For example, the assumption by scientists that reality is essentially physical in nature should be held in question, just as how the scientist might contest the assumption by religionists about the reality of the spiritual world.

3. Where do you think there may be a conflict between these two?

The areas of potential, and also actual, conflict between the two lay in their epistemological foundations and their conflicting claims about the natural world. As for the latter, the two obvious examples in the history of science pertain to the conflict between Galileo and the Roman Catholic Church on astronomy in the 17th century, and the conflict between Darwin and the theologians in the 19th century. In those two cases, they both make different claims about astronomy and human biology. But even then, the conflict is based on the assumption that there is a 'fact of the matter', and that both science and religion are in agreement on the framework that frames or defines the fact of the matter, and the parameters that are involved. In the case of astronomy, using the wisdom of hindsight, we now realize that there is no 'simple fact of the matter', since there is no absolute frame of reference, be it the sun or the earth.

As for epistemological foundations, scientific knowledge is based on rationalism and empiricism, while religion accepts a third dimension or source of knowledge, which is Revelation. Revealed knowledge is quite independent of the strictures of Rationalism and Empiricism when it talks about the 'After life', and the world of the Angels. Science, having rejected knowledge which is not based on the rational (mathematical/ logical) or the empirical (observations, experiments), cannot therefore accept the reality of the Afterlife, heaven or hell, or the world of the angels. But a religious believer accepts these as real. Hence there is a conflict here.

4. What have been the grounds for the development of conflict between these two?

I think the success of modern science since the 17th century, and the decline of Christianity in the West since the Renaissance, has a lot to do with it. Here I refer to Michel Foucault's theory about the relationship between knowledge and power in which the two are naturally reinforcing and sustaining. The power of religious authority in the medieval period ensures that the development of knowledge, including natural philosophy (precursor of science) is subservient to religion and theology. This is clearly the case in medieval universities in Europe and also the *Madrasahs* in Islam. With the decline of religious authority, and the ascent of a technologically efficacious science, religion could no longer retain its domination over science resulting in the autonomy of science from religious authority. For the modernists and secularists, this is a welcomes move that signals the movement away from an oppressive medievalism to an enlightened modernism. The further successes of science in the 19th and 20th centuries and its indispensable role for technological and economic development further ensure its position in modern society. Thus the new faith in science, which is seen as essential for modernity, replaces the faith in religion, especially in the West. In other words, the grounds which lead to a development of conflict between the two can be understood in largely historical terms and an understanding of the relationship between knowledge and power.

5. What has been the role of religion in the development of science in the West?

Religion, i.e. in the form of Christianity, has played both a positive as well as a negative role in the development of science in the West. But overall, and on balance, my evaluation is that, contrary to the commonly held view, I think religion has had a resultant positive effect on the growth of science in the West. The negative image of religion in relation to the development of science in Europe was mainly due to the repressive action taken by the Roman Catholic Church towards Galileo after the publication of his 'Dialogue on the Two Chief World Systems' in 1632. But I would say that was the exception rather than the norm, and in any case science continued to thrive not only in Protestant England and Holland after the event, but even in Catholic France which gave birth to some of the great European scientists on the Continent in the 18th, 19th and 20th centuries. In Protestant England, according to the Merton thesis, Puritanism was a religious force that was responsible for the development of science in 17th century England. Even in the Middle Ages, science in the form of natural philosophy was taught in the Faculty of Arts in the European universities which were under the control of the Church. Science was then a handmaiden of theology, and the institutionalization of science in medieval European universities was a key factor in the continuous development of science in Europe since the translation movement of the 12th century. Even Galileo, who was taken as a symbol of rebellion of science against religion, benefited from the education provided by Jesuit institutions such as the Collegio Romano. Another central figure in the birth of modern science, the English physicist Isaac Newton, was not only into science, but was also an alchemist and a biblical scholar. So the view that religion was an obstacle to the growth of science in the West cannot be sustained.

6. Can we have a religious science?

I am not quite sure what is meant by a 'religious science'. If what is meant is a science which supports religious beliefs and a religious world-view, by virtue of theories which naturally and autonomously unfold in the course of the development of science, then I would welcome such a possibility and such a science. On the other hand, if science is artificially or forcibly made to conform to some 'religious' mould, then I do not think that would serve the interest of either science or religion. Even then, that is assuming that such a move is possible, Lysenkoism notwithstanding. In the past, especially in the medieval period in both Islam and Christendom science is indeed 'religious science' in that it is made to serve the interests of religion. In the West, Greek cosmology and natural philosophy was used to support Christian beliefs. In Islam, astronomy was used in the service of religion. Recently, with the development of 'postmodern science such as quantum theory, ecology, catastrophe theory etc., the old reductionist mechanical view of a linear and deterministic universe has been replaced by a view of the world as indeterministic, holistic and complex, which I think is more in alignment with a 'religious' world-view. The quantum theory for instance is said to have parallels in Oriental philosophies such as Taoism. But if such a science can be called a 'religious science', then it is the product of a 'natural' marriage, not a 'forced' or 'arranged' marriage.

Another possible meaning to the term 'religious science' is knowledge of the order of nature and the structure of reality as given through traditional religion, and not through the 'scientific method'. Such a science or 'Ilm, I believe exists, but it cannot and should not be subjected to the same epistemological criteria and standards which govern our knowledge of the manifest world. Access to it must be through different means, and it should not be faulted or rejected if its doors cannot be unlocked by the keys of rationalism and empiricism.

7. Can science dispense with religion?

Indeed it can and has been doing so for the last few centuries. Modern science has been functional and operational since the 17th century and could be successfully applied to technology independently of religion. It is not a precondition for a scientist to be religious in order to do science. Scientists range from the religious to the atheistic, which implies that religion is irrelevant to modern science and that science can indeed be done without a commitment to religion.

Dispensing with religion however, does not mean that science has freed itself from values and the ethical context. Indeed science operates within its own value-system and ethical context, which Robert Merton had tried to capture through his 'Mertonian Norms'. But the limitations of the ethical context of science ultimately reveal itself when science is pursued within such a limitation. The search for objective truth about the natural world for instance could involve the search for knowledge about the effects of certain drugs on the human body. Here we face a problem since it is deemed "unethical" to conduct research directly on the human body because of its possible harmful effects. Hence the search for truth about the natural world has to be weighed against the 'immorality' of harming the human body. In this case the quest for objective truth is constrained by a 'moral truth' which comes from outside science. That 'moral truth' can come either from a secular ethics or a religious ethics. Similarly, the search for, and the application of scientific knowledge could also be subjected to ethical considerations. This has set the brakes in research on human cloning for instance. If science is a disinterested pursuit of truth about the natural world then there should be no prohibition or restriction on research on human cloning. However such a research and its possible applications, is denied precisely on ethical grounds. Thus even in a research context, science is not completely free and instead subject to controls by society. The moral imperative suggests that religion, or its 'functional equivalent', is indispensable after all.

8. Can one separate the domains of activity of science and religion completely?

The almost complete separation between the two domains of science and religion has in effect already occurred in most secular modern societies. Religion has been confined to the realm of the cultural, social, and symbolic while science, by virtue of its connection with technology and the economy has become a central pillar of modern society, imparting its world-view through the education system and scientific institutions.

Although such a separation has in fact occurred, the normative question of whether such a separation in indeed desirable, still remain. For the modernists who value scientific and economic progress, such a separation is indeed welcomed, because science is free from the control of religion. It is also symptomatic of the overall development of modern society which saw it as part of the progressive transformation from medievalism to modernity. However, in so doing, western society has thrown the baby out with the bath water, and the excess of modernity has now emerged and reared its ugly head. By claiming for itself exclusive right over knowledge of the natural world, coupled with religions inability to provide an adequate response, science has strategically claimed for itself a crucial territory which has effectively marginalized religion. However, some societies such as Islamic societies have been able to keep secularization at bay largely through its set of practices which makes the religion 'alive'. Recent philosophy of science, which emphasizes science as a 'set of practices' rather than a 'set of beliefs', has incidentally make respectable the existence of religion in modern society, because now science is no longer seen as having an epistemological monopoly over nature, but consisting mainly in set of 'successful practices'. Not all philosophers of science however, subscribe to such a view of science, and some die-hard realists still want to maintain the idea of the cognitive superiority of science as being the reason for its practical success. My take on this is that a continuing dialogue between science and religion should be encouraged so that we can get a better view of both and of their relationship to one another. But the religionists have to do a better job by taking the challenge of science seriously and updating their knowledge of modern science in order to provide an adequate response. Otherwise we will end up with a scientistic culture with its scientific reductionism and materialism devoid of religious and human wisdom.

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1. What is your definition of science and of religion?

Both science and religion are human activities in response to our experience of the world around us. Science is the application of a method to observations of the physical world to derive testable models of how objects or phenomena in that world behave. Science is characterized by building models that, in some sense, approximate the real world. Science, by definition, does not have observational access to non-physical reality. Science is experimental rather than experiential. Religion, on the other hand, is the human response to the both the physical and non-physical reality of the universe. Religion does not build models of reality, but rather attempts to confront the reasons for that reality. As a result, religion constructs explanatory systems that ultimately require an act of personal commitment in the form of faith or belief. Religion is experiential rather than experimental.

2. Do you see any conflict between your definitions of these two concepts?

In the sense that both are human activities carried out in response to the experience of living within creation, there is no conflict. In the sense that they each represent views of how this creation can be understood, there is no conflict. However, since they operate by different methodologies (experiment vs. experience), they appear to be in conflict. I would contend that they are no more in conflict that any two activities that take place using different approaches and tools. Thus, science and religion are no more in conflict than are science and art.

3. Where do you think there may be a conflict between these two?

For those who wish to see science and religion in the conflict mode, as described by Ian Barbour and John Haught, there exists no way of resolving a view that derives from experience with one that results from experiment. In addition, since science focuses exclusively on the physical aspects of creation, conflict arises from the appeal by religion to explanatory systems that invoke non-physical reality. Thus, for example, science builds models that do not rely on Divine intervention, while religion finds reasons for existence in the very nature of a transcendent God.

4. What have been the grounds for the development of conflict between these two?

At the height of the Middle Ages the scientific and religious views of the world were more or less in harmony. Aristotelian thought, having been nurtured and commented upon by the great Muslim scholars such as ibn Rushd and ibn Sina, returned to the West. St. Albert the Great and his student, St. Thomas Aquinas, used this philosophical system to derive a cosmology in which everything in both the physical and non-physical aspects of reality could be viewed as a coherent whole. At the heart of this system was, of course, the geocentric universe of Ptolemy. God was in His heaven (the outer sphere or *primum mobile*) and all was right with the world, meaning the earth at the center.

Problems with this did not arise until Mikolaj Kopernik (Nicolaus Copernicus) proposed a "simpler system", By placing the sun at the center and having all of the planets, including the earth, revolve around it, Copernicus reduced the need for elaborate epicycles to explain astronomical observations. However, he also disrupted the careful organization of the cosmos that had been so well integrated with religious thought.

With the observational work of many, especially that of Galileo Galilei, evidence for the heliocentric model of Copernicus began to mount. It is possible to point to these events as the break between science and religion. However, I hold that this is too simplistic. While the paradigm shift in the cosmological model did have profound effects on churches in the centuries leading into the Renaissance, many of the natural philosophers whose work we point to as the origins of Western science, such as Newton and Pascal, were, in fact, religious persons. The so-called conflict did not take full shape until the modern era, with its emphasis on empiricism, reductionism, and materialism.

5. What has been the role of religion in the development of science in the West?

Science in the West was born within the university system of Europe. Of course, that system arose, in part, within the framework built for the education of the clergy. And so, the early universities were run in part or in total by the Church. An additional role for religion in the history of science, it seems to me, is the fundamental assumption that the natural world is ordered and that this order can be appreciated by the scientific method. One could argue that this assumption derives from experience. However, it is also true that the philosophical substructure upon which Western science was built presumed the belief of the Abrahamic religions that the world as we know it was created in a purposeful, and therefore ordered, fashion.

6. Can we have a religious science?

If by a religious science we mean a religion based upon scientific principles, I would argue that this couldn't be. Such natural theology is inherently dangerous, in the sense that science, unlike religion, tends to be revisable. Thus, any religious principle that claims to have "proof" in a scientific theory is subject to being discarded when that theory is overturned, in the sense meant by Karl Popper and Thomas Kuhn, by observation. The natural theology of William Paley at the beginning of the 19th century, based upon his notions of Divine design, was dramatically confronted by the evolutionary model of Charles Darwin, using descent with modification from a common ancestor as an explanatory model.

On the other hand, we can envision a science that is carried out in collaboration with religious thought. A theology of nature, such as this, entails not a proof of religious ideas but rather a religious reflection based upon the understanding of nature through the sciences, and a concomitant scientific enterprise that honors this reflection.

7. Can science dispense with religion?

Can science dispense with the visual arts? Can science dispense with literature? These might be equally valid questions. To all of these, I must answer unequivocally "no". To say otherwise is to risk the hubris of scientism: the belief that all human activity can eventually be subsumed under the mantle of the sciences. A recent attempt at this can be found in Edward O. Wilson's book, "Consilience". Although its title suggests a "coming together" of ideas, the real aim of the book is to show how everything in our experience is subordinate to the hegemony of Western science.

8. Can one separate the domains of activity of science and religion completely?

Methodologically, this is certainly the case. Science deals with the collection of experimental data and the construction of models. Religion deals with introspection and the value of experience, culminating in an act of faith. However, as human activities, the two enterprises share a common ground. Scientists exercise a "faith" in the inherent order of nature. Otherwise, it would not be possible to design experiments that can be replicated. Religious persons rely on their observations and experience with the world as a way of discernment to continue on a faith journey. There is also common ground to be found in the viewpoints that each brings to bear on the human condition. Religions cannot ignore the advances in science that lead to a richer understanding of the workings of the physical world of creation. Likewise, science must heed the ethical and moral proscriptions that derive from religious reflections within a culture. Both are grounded in a philosophical system that is, at some level, an attempt to understand the fundamental nature of reality.

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SCIENCE AND RELIGION

From the earliest times, men and women have looked at the stars and wondered what the purpose of it all is. That question is still with us today. Generation follows generation, and most of us are soon forgotten. We are brief leaves of the flame of life, received from our parents and passed on to our children. When we die, is that the end? If so, why did we struggle and suffer? If not, then what lies beyond death, and does it depend on the way we have lived our lives? Sometimes we are pleased with our actions and feel good, and at other times we regret what we have done, and feel remorse. Is this just the result of social conditioning, or are there some standards of right and wrong to which we must conform? If so, how do we know what is right and what is wrong? Should we just look after our own interests and those of our family? How extensive is our family? Is it just our nearest blood relations or does it also include our tribe, our village, our town, our country or all mankind? Does it extend to future generations? Is it right for us to live well, while others are starving? What about the animals, the plants, the land and the sea? Can we use them to satisfy our needs and our pleasures, or do they also have rights?

In primitive societies, most men and women were preoccupied with the struggle to survive, and had little time to spend on such questions. Some exceptional individuals, however, were more concerned than others, and gradually they were set apart and given the duty to try to find an explanation of it all, to find a story that would make sense of life. They were the shamans, the first priests. They knew that we do not control our lives. We do not make our children, nor do we control the forces of nature. Things cannot just happen: there must be some force or person in control, some great spirit. Perhaps there are lesser spirits that control the forces of nature, the spirits of the sea, the forests and the mountains. If there are such spirits, who can make or break us, then we must try to please them so that they will bring rain to make our crops grow, and sunshine to ripen them, so that we have a good harvest. How can we placate these gods, and how do we know if we have satisfied them? Is thunder an expression of their anger, and sunshine of their pleasure?

The shamans thought about these questions and developed elaborate stories to answer them. They performed rituals to please the gods and ensure success in life. They laid down and enforced codes of belief, and thus came to exert great powers over life and death.

The shamans were also repositories of knowledge about the natural world. They knew the properties of plants and the ways of animals, when to plant and when to reap. At a primitive level, they were the world's first scientists.

With the growth of civilization and the increasing complexity of life, the roles of the priest and the scientists diverged, until it became no longer possible for them to be combined in the same person. Now, they are seen to be highly specialized and separate activities. If however they are separate, can they interact with each other in any way, and if not, then how are they related?

Religion remains what it has always been; a set of beliefs that provides a framework for our lives, answers the fundamental questions about the meaning of life and death, sin and forgiveness, and provides a system of rules that should guide our lives. There have been many answers to the fundamental questions, and so many religions. Some have died out with the passing of the years, but there still remains a rich variety of religions flourishing in the world today.

The Scientific Knowledge of the World

The word science also has many meanings, from the primitive knowledge of the shamans to the highly sophisticated knowledge of today. Science is our knowledge of the natural world, but more precisely it may be defined as the totality of our organized and verifiable knowledge of nature.

The historical development of science has been quite different from that of religion, particularly in the last few centuries. It began with experiences of the world in all its variety: the rocks and minerals, plants and animals, liquids and gases, together with the results of observations of the sun and the moon, the stars and the planets. Historically, it proved very difficult to obtain a deeper understanding, to organize this mass of material into a systematic and intelligible whole. It was still more difficult to penetrate below the surface of things, to see the many subtle inter-relations between apparently disparate phenomena.

The ancient civilizations of the past had no science in the modern sense of the world. A brilliant start was made in ancient Greece, but even that failed to develop into a self-sustaining enterprise. The first beginning of modern science was in the High Middle Ages and it finally came to maturity in the Renaissance.

Science in its modern form is a detailed and quantitative knowledge of the behaviour of matter, expressed mathematically in the form of differential equations. Newton's equations of motion, together with his law of universal gravitation, provide a concise and extremely accurate description of the motions of the solar system. Maxwell's equations describe all electromagnetic phenomena, since the law of force is accurately known. Schrödinger's equation does the same for atomic phenomena, and would do the same for nuclear motions if the law of force were better known. This tightly-integrated body of knowledge constitutes theoretical physics, the paradigm of the sciences. In principle, it can be extended to include chemistry, biochemistry and the biological sciences, but usually the mathematical difficulties of doing this are insuperable, and so progress can only be made by developing macroscopic concepts proper to those branches of science. Modern science is a self-sustaining enterprise, and goes forward in accord with its own internal criteria. There is still much to be learned, but its continual progress seems assured.

The Relation between Science and Religion

Thus when we come to relate science to religion, we have only one science to consider, but many religions. Science and religion seems to be quite separate activities with different purposes. Science is concerned with the phenomena of natural world, religion with ultimate realities. Science tells us how things are; religion how they ought to be. It might thus seem that there is no way they could interact. And yet, historically speaking, they have interacted in many ways: most obviously, when scientists or religious authorities have exceeded the proper bounds of their subject. When this happens, the interaction can be very strong and has led to what has been called the warfare between science and religion. There have been many cases where this has occurred, and these have been eagerly exploited by secularists in order to discredit religion.

Science and religion are related in a more subtle way at the level of presuppositions. Science is based on certain very definite and quite special beliefs about the natural world, and these are religious beliefs. Some religions provide all the necessary presuppositions, some only a few, and some none at all. Those in the latter categories are inevitably antithetical to science.

The Role of Religion in the Development of Science

This subject can best be approached by asking why it is that modern science as we know it today began in Western Europe a few centuries ago, but not in any of the ancient civilizations of the past. If we look at these civilizations, in China and India, in Babylon and Egypt, in Greece and Rome, we find well-developed social structures, magnificent artistic and architectural achievements, imperishable drama and philosophy, but nothing remotely equivalent to modern science. We find great skill in the working of wood and metal, ingenious mechanical contrivances and perceptive philosophical speculations about the world, but not the detailed understanding of matter, from quarks to galaxies, expressed as the solutions of a few differential equations, that is the hallmark of modern science. Most of the great civilizations of the past were able to provide all the material requirements for the growth of science. There was a leisured class, technical skills and systems of writing and mathematics. Obviously this by itself is not enough. What was lacking was the attitude of mind towards the material world that is the essential precondition of science, and in some cases a social structure that allows new ideas to flourish.

What do we have to believe before we can hope to become a scientist? We must believe that the world is in some sense good, so that it is worthy of careful study. We must believe that it is orderly and rational, so that what we find out one day will still be true on the next day. We must believe that this order is open to the human mind, for otherwise there would be no point in trying to find it. We must believe that this order is not necessary order that could be found out by pure thought like the truths of mathematics, but is rather a contingent or dependent order that can only be found by making experiments.

In addition to these beliefs about the world itself, the development of science depends on moral convictions such as the obligation freely to share any knowledge that is gained. Furthermore, once it becomes clear that scientific understanding can be applied to grow more food and to cure diseases, then its future development is encouraged if we believe that we should do these things to help our fellow men.

These beliefs may seem obvious to us, but in the context of human history they are very special. They are not found in the ancient civilizations, and that is why science in the modern sense never developed among them. In some cases, particularly in ancient Greece, an impressive start was made by a few individuals of genius, but they lacked the support of a coherent set of beliefs shared by the whole community, and it never became a self-sustaining enterprise.

A new beginning, a fresh style of scientific thinking, was made possible by the Judeo-Christian vision of the world. The God of the Hebrews is very different from the God of Plato or the Prime Mover of Aristotle. According to Plato, the world is generated in accord with the eternal ideas, and Aristotle's Prime Mover is the first cause from which everything else emanates; in both cases they necessarily produced the best of all possible worlds. Furthermore, Aristotle believed that human reason can discover the constitution of the world and why it must be made as it is. In sharp contrast, the God of the Hebrews freely created a world completely distinct from Himself, and His actions are inscrutable to men unless He freely chooses to reveal His plans.

The book of Genesis bears witness to the Hebrew belief in a transcendent Creator from its opening phrases: "In the beginning, God created the heavens and earth"... "And God saw all that He had made, and indeed it was very good" (Gen 1:31). In contrast to the confused creation myths of the surrounding nations, the creation story in Genesis has a clear logical structure, expressed in poetic form. It clearly expresses belief in the absolute sovereignty, rationality and benevolence of God who brings everything into being by His command and communicates His own goodness to them. Although not expressed in modern language, it contains the essential beliefs about the world that must be held if science is to flourish.

God creates freely, so it is not possible to deduce the structure of the world by rational argument, as Aristotle believed. Instead, we must examine the world by observation and experiment to find out how God in fact made it. The world is rational because it was made and is kept in being by a rational God. It is contingent because it depends on the Divine Fiat: God could have chosen to make the world in a different way. There is here a delicate balance between the rationality and the freedom of God: tip the balance one way or the other and you have a belief in a necessary or in a chaotic world, both inimical to the growth of science. Finally, we are assured that the enterprise is a practicable one, that the world is open to the human mind, because God charged us to have dominion over it, and He does not command the impossible: "Be fruitful, multiply, fill the earth and conquer it. Be masters of the fishes of the sea, the birds of heaven and all living animals on the earth" (Gen 1:28). Whatever wisdom we acquire, we must pass on to others: "What I have learned without self-interest, I pass on without reserve; I do not intend to hide her riches. For she is an inexhaustible treasure to men, and those who acquire it win God's friendship" (Wisdom 7:13).

The birth of Christ further ennobled the matter of the universe, and his teaching reinforced and enhanced the teaching contained in the Old Testament. The debilitating belief in a cyclic universe, held in all ancient cultures, was decisively broken by the Christian belief in the uniqueness of the Incarnation. Henceforth, history was no longer an infinite series of dreary cycles, but a linear story with a beginning and an end. Inherent in Christ's teaching is a set of beliefs about the world that eventually led to the first viable birth of science in the High Middle Ages, and to its subsequent flowering in the Renaissance.

In the early Christian centuries, several philosophers examined the cosmology of creation in the context of Christian theology. In the 3rd century AD, Lactantius rejected the Stoic belief that the world is simply the product of chance, without any providential design. He emphasized that God with infinite power created the world out of nothing, so that He is absolutely separate from His creation. Nature is designed by God ultimately for the benefit of men, and has no power of its own that does not come from God. This implies that nature is an inanimate mechanism operating according to fixed laws. In the 4th century AD, Basil of Cappodocia insisted, contrary to Plato, Aristotle and other Greek philosophers, that nature is not animate, nor is it a living thing endowed with senses. When plants and animals grow, they do so following God's command and in accord with His laws.

The Christian beliefs concerning creation emphasize not only that the universe was created by God out of nothing and in time, but that the universe is totally dependent on God and totally distinct from God. The universe at any instant is sustained in being by God, and without this sustaining power it would immediately lapse into nothingness.

At that time, there were passionate debates about the nature of Christ, and heresies abounded. To define the true nature of Christ was the task of a series of Councils of the Church, and of these the Council of Nicea (325) formulated the creed that is widely held today:

"Credo in unum Deum, Patrem omnipotentum, factorem coeli et terrae, visibilium omnium et invisibilium. Et in unum Dominum Jesum Christum, Filium Dei unigenitum. Et ex Patre natum ante omnia saecula. Deum de Deo, lumen de luminae, Deum verum de Deum vero. Genitum, non factum, consubstantialem Patri; per quem omnia facta sunt...".

It is easy to recite these hallowed phrases without fully realizing their impact, and still more their importance for science. The beginning of the Nicene creed asserts the creation of the universe by God: 'Factorem coeli et terrae'. One of the early heresies was pantheism that failed to distinguish between God and His creation, holding that it is in some way part of God. In the Greco-Roman world, the universe was thought of as an emanation from a divine principle that is not distinguished from the universe. Pantheism is explicitly excluded by the Nicene creed when it says that Christ is the only-begotten Son of God. Christ is begotten, not made. Only Christ was begotten and thus shared in the substance of God; the universe was made, not begotten ("Et in unum Dominum Jesum Christum, Filium Dei unigenitum... Genitum, non factum"). Since pantheism was one of the beliefs preventing the rise of science in all ancient cultures, the Nicene creed prepared the way for the one viable birth of science in human history.

Many ancient cosmologies held that the world is a battleground between the spirits of good and evil. This dualism is inimical to science because it makes the world unpredictable. Dualism is excluded by the Nicene creed when it says that all creation takes place through Christ ("per quem omnia facta sunt").

In his Epistle to the Colossians, St. Paul says that in Christ all things took their being, and were all created through him and in him (Col 1:15). He stressed Christ as the divine logos and the consequence that the creation must be fully logical and orderly. He referred to creation out of nothing when he praises God "who restores the dead to life and calls into being those things which had not been" (Rom 4:17) and promises that through Christ they would understand "the breadth, the height and the depth" (Eph 3:18).

Inherent in the Christian doctrine of creation is the belief that God freely chose to create the universe. He was not in any way constrained either to create or not to create it in the way that He did. It is therefore not a necessary universe in the sense that it had to be created or could not have been created otherwise. There is therefore no possibility of finding out about the universe by pure thought or by a priori reasoning. We can only hope to understand it by studying it and by making experiments. Thus the Christian doctrine of creation encouraged the experimental method, essential for the development of science.

Early in the twelfth century, Hugh of St. Victor saw the study of the natural world as a twofold process, first the ascent of reason to the purely spiritual and then a descent to examine in its light the information provided by the senses. In so doing, he expressed the mathematical rationalism of Plato and inspired his contemporaries William of Conches, Thierry of Chartres and Adelard of Bath, for whom reality was autonomous nature to be grasped by reason.

In the twelfth and thirteenth centuries, there was a remarkable flowering of creativity in many areas of human activity. At the sociological level, this was largely due to the new concept of treating a group of people as a separate legal entity. This enabled them to act with considerable freedom, but always subject to the law. It came about as a result of what has been called the Papal revolution, by which the Church asserted its freedom from the civil authorities. Previously, it was usual for clerical appointments to be made by the civil authorities, but now the Church insisted that it alone had the authority to do this. This established the Church as a separate legal entity and put constraints on the power of civil authorities. The most significant result was the creation of a separate legal system with its own area of jurisdiction. Once this idea was established, both Church and State became federations of many corporations, each with a measure of autonomy. Among these were cities, the first universities, the legal and medical professions, banks and business organizations and later on the scientific community itself.

In the High Middle Ages, many universities were founded by the Church to provide higher education for those educated in the monastic schools, to train future clerics and to facilitate the spread of learning. It was in these universities that the decisive breakthrough that led to the rise of modern science took place. The works of Aristotle and the other Greek philosophers were translated into Latin and were used by theologians to express the truths of the faith in more precise language, and by philosophers to refine their view of the natural world.

So great was the prestige of Aristotle that the philosophers of the medieval schools taught by commenting on his texts. Some of Aristotle's teaching, however, was inconsistent with the Christian faith, and the philosophers did not hesitate to differ from Aristotle when it seemed necessary. In 1215, the Fourth Lateran Council decreed that all creation, spiritual and material, took place out of nothing and in time. This is directly contrary to Aristotle's belief in the eternity of the world accepted as a self-evident truth. There was intense discussion on a variety of topics, notably concerning the creation of the world and the motion of bodies. In 1277, the bishop of Paris, Etienne Tempier, found it necessary to condemn 219 philosophical propositions as contrary to Christian belief. His main purpose was to defend God's absolute power against any attempt by the Aristotelian philosophers to set limits to it. Several of the condemned propositions set limits to God's power, saying for instance that He cannot make more than one world or to move the world so as to produce a vacuum. Tempier thus reasserted the belief that God can freely create any world, just as He chooses. This was a turning point in the history of thought, as it liberated philosophers from bondage to Aristotle and channelled philosophical speculations about motion in a direction that led eventually to the destruction of Aristotelian physics, thus opening the way to modern science.

The theology of divine omnipotence had important consequences for the development of science as a result of Aquinas' distinction between God's absolute and ordained powers. God always has absolute power over all things, but He endows the natural world with specific natures, according to His plan for creation. These normally determine the behaviour of natural phenomena. It thus becomes a reasonable activity to try to find out about the world. Normally, by virtue of God's ordained power, the natural world strictly follows God's laws, and yet this does not prevent God from doing whatever He chooses by virtue of his absolute power. This reinforces the stability of nature as a sign of God's faithfulness so frequently expressed in the Old Testament (Jer 31:35-36; 33:25-26), while leaving open the possibility of miracles.

One of the medieval philosophers, Jean Buridan, was particularly interested in the nature of motion. This is the most fundamental problem of physics, and so if science is to begin it must begin here. In full consistency with his belief in creation, he wrote that "God, when He created the world, moved each of the celestial orbs as He pleased, and in moving them He impressed upon them impetuses which moved them without Him having to move them any more except by the method of general influence whereby He concurs as co-agent in all things which take place".

This shows a clear break with Aristotle, who required the continuing action of the mover throughout the motion. What Buridan called impetus was later refined into the concept of momentum, and the idea in the above passage became Newton's first law of motion. Buridan's works were widely published and his ideas became known throughout Europe, and in particular to Leonardo da Vinci and hence to the scientists of Renaissance times.

The Christian belief in the creation of the world by God also undermined Aristotle's sharp distinction between celestial and terrestrial matter. Since they are both created, why should they be different? Indeed, Buridan illustrated his concept of impetus with reference to the long jump, thus implicitly presupposing that celestial and terrestrial motions are similar. This made it possible for Newton to see that the same force that pulls an apple to the ground also keeps the moon in its orbit.

Thus we see that the beliefs concerning the natural world that are part of Christian theology are the same as the presuppositions of science. and so we can understand why it was that science as we know it achieved its first viable birth in the High Middle Ages, which was the first time in history when there existed a civilization holding the Christian Faith.

Science and Other Religions

There are many religions that deny one or more of the presuppositions underlying science, and these are necessarily in conflict with it. For example, the Manichees believe that matter is evil, thus denying the essential goodness of matter, and so they are opposed to science. Likewise the belief that matter is an illusion, held by some eastern religions, is inimical to science. Christians who live only by the Bible and reject the authority of the Church can readily accept beliefs contrary to science. Thus some interpretations that rely on the apparent literal sense conclude that the world was created about six thousand years ago, presumably with fossils embedded in the rocks. This is not only contrary to a reasonable concept of God, but is also anti-science. Further examples of beliefs inimical to science are those of the Nazis in Germany and the Marxists in Soviet Russia. The havoc wrought on the scientific communities in those countries is an eloquent testimony to the effects of anti-scientific philosophical presuppositions. Hundreds of leading scientists were persecuted in Germany and forced to leave, and in Soviet Russia whole branches of science, such as genetics and relativity theory, were destroyed. The experiences in these countries show very clearly that science cannot dispense with religion, in the sense that if the essential presuppositions of science are denied, even implicitly, then science will be progressively debilitated and may even die.

The role of religion in scientific research is thus to provide the beliefs about the natural world on which it rests. These need not be held explicitly; indeed in Europe they are usually held implicitly. It is thus not essential for scientists themselves to be Christian, so long as they share the beliefs of the community. Jewish and Muslim scientists, since they also believe in one all-powerful God, hold many of them as a result of their own religious beliefs. It is not necessary for scientists to be continually adverting these beliefs during the course of their daily work. If they obtain some results that are difficult to explain, this should be a stimulus to further scientific work, not an argument for the intervention of God. It is always necessary for them to show their respect for the truth and the rights of other scientists, as is required by many moral codes.

It is thus not possible to separate completely the domains of activity of science and religion. They are indeed completely separate as regards their subject matters and methods, but they do interact in several important ways. The most important is that it is religious beliefs that provide the fundamental beliefs about the natural world that provide the essential foundations of science. If these are denied, then science cannot grow or even survive.

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1. What is your definition of science and of religion?

a) Science is based on measurement procedures objectively done in the physically visible and measurable world.

Religion – in its source-roots – is based on internal revelation of its prophets. Also – among other factors – on intuition and conviction of the spiritually developed men who take part in its growth.

b) The primary and declared aim of science is to gain knowledge about the laws and mechanisms which govern the outer (and to an extent inner) world.

The declared and primary aim of religion is to spiritually develop and transform mankind thus realizing what is called – in religious language – "The Kingdom of God on Earth". Internal transformation of individuals practicing some religion may be noticeable also to outsiders and non-believers as an objective and visible fact.

2. Do you see any conflict between your definitions of these two concepts?

There is no conflict between *definitions*. There has been – many times in history – conflict between the real objects to which refer these definitions, i.e. between science and religion.

3. Where do you think there may be a conflict between these two?

There may be no conflict as both religion and science understand – in the light of the above sketched definitions – their respective areas of activity, methods and languages used in these activities and – what is most important their respective aims. Thus they can both, each in its own way, serve mankind in the present world and God beyond.

The conflict may arise when there are unjustified extensions beyond the respective areas of activity and/or distortions of the above defined aims.

For example, such extensions were made by various trends in science and science based on philosophies which claimed that what cannot be measured and interpersonally clearly communicated, does not exist (e.g.: extreme forms of Bridgmann's operationalism, of Vienna originated positivism and others). A conflict arises also when religion – by literally keeping to scriptures – tries to talk with authority about matters which should be and are a subject of science. A well-known example of such "trespassing" happens when religion tries to force a scriptural, old, pre-scientific version of the natural history of the inanimate *and animate* world (which can and should be dealt with by modern cosmology, biology and the theory of evolution).

4. What have been the grounds for the development of conflict between these two?

The conflict developed primarily on the epistemological level: by not clearly enough distinguishing between the main function of science which is of cognitive character and that of religion which is aiming at internal, spiritual transformation and development.

But there may be also – as has often been the case in our history – other grounds for conflict. The most often situation has been – and alas still is – when religion and/or science – have been used purely as an instrument for gaining political power and/or economic wealth (as happened for example many times and in many places in the history of medieval Europe with Christianity).

5. What has been the role of religion in the development of science in the West?

The development of science in medieval Europe has been enhanced by Church's universalism and by the universal use of Latin as the language of educated people and of the Church. Later, science developed rather independently and separately from religion.

6. Can we have a religious science?

A science could be qualified with this adjective if it qualified its "*meta*-spirit" and over-all objective in a universal, beneficial to all humanity way. It should neither *a priori* negate existence of the spiritual Reality nor be completely alien to its material reflections (see point 6 below). To be more explicit, such a science would have to be:

1. Self – limitating – it should direct its efforts *only* in directions which might benefit mankind in the material, mental and spiritual sphere. Of course in many instances it is *a priori* difficult to say what research area *might* prove beneficial. However there are many research areas which *a posteriori* we can qualify negatively: e.g. development of ever more sophisticated and powerful weapons and means of mass destruction.

2. Holistic and interdisciplinary – as exemplified by the science of synergetics.

3. Acknowledging exceptionality and sanctity of life – and in particular of human life.

4. Realization of postulates 1 and 2 would mean among others that some of the research effort would have to be devoted to the individual and social synergetic effects in all spheres of human activity and interactions: emotional, intellectual and spiritual.

5. Practical and efficient especially in the social and spiritual area. It means that its major effort should be directed to the conservation, dissemination and implementation of the research results which have already proved beneficial: of the ever important knowledge and ever valid truths.

6. Religion may not only direct science towards morally good research goals, it can closely cooperate with research areas which are directly connected with human spiritual activities: For example one could mention here research which deals with reflections of prayer and meditation on various physical, physiological and mental human body characteristics which are measurable by scientific instruments. To be more specific: among others healing effects of prayer, change of various physiological parameters induced by meditation (e.g. change of EEG patterns and frequency of brain origination electromagnetic radiation) and lead to a state of deep rest, improving social relations, etc. Science concerned with scientifically measurable reflections of the human spiritual activities and with the moral value of science's goals could be truly called *religious science* (and in the last 50 years, such research has been effectively performed). The only problem now is to make universally known *and applied* in religious and everyday life – for the benefit of men and the glory of their Creator.

7. Scientific community should give lead not only in its ability to increase the body of knowledge but also in an ability to release strong "synergistic effects" – of interpersonal integration, of the spirit of co-operation and not competition – among all its members. To achieve this, the interpersonal interaction should not limit itself only to the intellectual level but should include also the spiritual level. This level could be activated by some form of common religious or other spiritual practice.

7. Can science dispense with religion?

As long as religion may furnish science with morals, humanly channeling its activities and inspiring it with the noblest ideals, it cannot. A science divorced from morals, indulging in expensive research in quest of scientific fame or of military power is a dangerous science indeed, a science that may ultimately lead to destruction of man, its creator.

8. Can one separate the domains of activity of science and religion completely?

In view of the above – see answers to questions (6) and (7) – one cannot and should not. A beautiful example of an attempt to synthesize science and religion (understood in the very general sense of spirituality, of approaching to the Divine in man) has been given in the middle of this century by French priest and scientist: Teilhard de Chardin. His vision of the evolution of our world expressing itself in a complexity curve pointing to and pulled by its Divine Attractor may be heralding development of a "great unification theory". Such a theory could be based on the modern and recent developments in the sciences dealing with complex systems: chaos theory and its orderly counterpart (**synergetics**).

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Introduction

Before I give my definitions of science and religion and address the question of conflict, I would like first to set forth a broader context for my response. I would like to give some overall views of the world from which I may more easily furnish answers to the posed questions. These ideas are more fully developed in the chapter entitled, "Empathy, Evolution and Altruism", which I contributed to the book, *Altruism and Altruistic Love: Science, Religion and Philosophy in Dialogue*, S. Post, et. al., eds., Oxford University Press (2002).

Throughout evolution we see the development of increasingly complex external morphology with the concomitant refinement of internal mental capacities. A major development in the early evolutionary process was the differentiation of the head region. This externally evident demarcation, with its organs of sensory perception and communication, was paralleled internally by cerebral structures capable of processing more complex impressions of the surrounding environment and of regulating the feelings and functions of the organism. The upward process of complex integration of an organism's "inner life" with its external action and presentation of self was further extended in Homo Sapiens with the radical cerebral reorganization that accompanied the transition to human upright posture. With upright posture, came coordinated revisions of body form, increased range of motion, and the transformations of mind that made possible new relations with the world.

As we gain perspective on the evolutionary panorama, we see an emergence of genuine novelty that culminates in our species. What appears along the phylogenetic process is an overall increase in a generalized type of freedom of the organism relative to its environment. This broad sense of freedom represents the capacity for nature to transcend itself, to leap beyond that which exists and to express new possibilities and powers. In this sense, we can see freedom as a fundamental characteristic of nature as a whole. In human nature, that freedom takes a truly astonishing leap in the extensions of personal and social relations made possible by empathy.

The biological foundations of empathy are far more than a simple system of signs to be expressed and observed. Rather, empathy is a form of intersubjectivity in which the observer actually participates in the feelings of the other. This extraordinary capacity is built on a combination of evolutionarily ancient emotional responses and more recent anatomical and neurological innovations unique to primates and highly refined in human beings. Empathy is the culmination and subsequent extension of adaptations formed by the phylogenetic process, and applied toward fuller and more effective coordination and communication.

Our understanding of the biological basis of empathy that gives us an appreciation of the way our particular evolved human form of embodiment, with the physical and mental capacities we share, provides a common "language" of mental categories, emotional responses, and shared needs. These common characteristics are the basis for intelligible communication and genuine social community. Human culture, mediated by empathy, allows an individual to develop a sense of self, as well as an awareness of the inner personal nature of others.

It is remarkable that these components are so deeply grounded in our biology. Our particular evolved form with its unique physiological and neurological structure provides us with a common biological basis for our emotional responses, mental categories and psychological needs. Mediated by empathy, these in turn are the basis for intelligible communication, and genuine social community and culture, all within the context of the sense of self and others. And out of such awareness of the other, in the shared experience of human life, arises the moral awareness and communal standards necessary to regulate social interaction. Despite local cultural variations, there is a substantial core of shared, cross-cultural moral sense that is based on our common biology and natural environment. The commonality of our biological needs and our personal freedoms ensures the similarity of our individual life journeys' challenges and dynamics. And with our capacity for language and imagination, we weave similar interpretive stories, cultural narratives rich with ideals and aspirations that shape our shared desires.

Such a moral culture, rooted as it is in biological nature, can be seen as itself a phenomenon of nature. From the perspective of biological evolution, organisms adapt to fit their ecological niches, and become congruent with the reality surrounding them. The nature of the organism thus reflects some aspect of environmental reality. It is therefore reasonable to ask if the development of moral awareness, and specifically the notion of transcendent moral truth, evolved in congruence with a corresponding moral characteristic of nature. In this sense, the evolution of progressively higher degrees of freedom reflects a freedom that is embedded in the very nature of nature. In particular, human freedom has evolved in response to a type of world in which such freedom is possible. By the same argument, the emergence of moral culture could be regarded as reflecting a fundamental aspect of reality, in addition to its social utilitarian benefits, rather than being nothing more than a type of survival strategy serving a more primordial biological agenda.

I have argued that empathetic human moral community represents an unfolding of deep characteristics of nature itself, with profound implicit meaning. I have suggested that such phenomena be understood in the context of a broader concept of nature. Even to consider such a possibility, however, requires us to relax naturalistic presuppositions that exclude from initial consideration the category of moral truth. But we must provisionally undertake this disengagement in order to investigate what interpretation may most fully fit the available evidence.

The idea that the moral dimension of human life is in some sense a product of the universe, a part of the objective order of nature, is discordant with our prevailing scientific culture, however. Deterministic materialism and reductionistic mechanism dominate contemporary scientific thinking and theories, and carry with them a skepticism concerning moral constructs and motivations. To assert an objective ethical order within nature would be to affirm teleology, the reality of human freedom and the unique status of our species. Yet, these are rejected from current scientific culture for reasons that are more ideological than evidential. For the stubborn evidentiary fact remains that human beings persist in considering the categories of good and evil as real.

It is appropriate to ask how such phenomena might be investigated further scientifically, with a view to benefiting from the resulting insights as we seek to preserve and enrich both the flourishing and freedom of human life. To the extent to which such phenomena represent an emergent phenomenological level, novel scientific methods appropriate to such a level will be needed to investigate them in their fullness. Furthermore, it would be strategic to explore the highest expressions of such phenomena as a way of identifying the relevant parameters. Altruistic love, which is the form of altruism with a minimum of egoistic motivation, would seem to be an appropriate candidate for such study; and an appropriate way to investigate it would be to collect and analyze vital examples of it in actual historical and present human lives.

In the view of the world expressed above, I regard truth as a unity. I'm interested in how the world is itself a cosmos, an order, arrangement and beauty; how there is an integrated intelligibility to the world. I'm interested in how our understanding of that intelligibility is grounded, not only in abstract mathematical metaphor, but also more deeply through embodied existence; how the whole world studied by science, but known more fully by all types of perception and integrated knowledge, provides an intelligible language for a meaningful story. There is a sense that within this natural world of matter in motion, something more is known to us – an "order" that is "extraordinary" in that it contains a story of great significance known through embodied being. We will never understand the world in its fullness; but we may understand fully in the sense that we may understand what it's really *about*, its significance, even though we may not understand all its details.

When I consider what I know of reality through the basic approach of looking as its material substrate, I see something that is rich in possibility and potential. To try to understand how that potential emerges from its basic components is the challenge of the reductionistic approach. But at the other side of the phenomenological spectrum from mathematics are the reality of the moral and the challenge of comprehending the meaning of the systematic whole. Looking at it from this other side, what we might call the "higher" order things, of consciousness and spiritual awareness, we can see how these reflect backwards to illuminate the "lower", more elementary foundational, material realities. The lower, with all its potential is finally only understood in the light of the higher. In that sense, my religious belief is that God is the principle of intelligibility of the universe. It is His light that illuminates the world. And this light gives us not simply an objective description of reality, but an understanding of a fuller kind of reality, of a resonant radiance of glory, a resonant beauty in which all conflicts of comprehension find their final resolution. The world, and its unfolding dynamic of discovery through the history of life, is a drama through which matter ascends to a comprehension of its Creator, its moral and spiritual significance.

Therefore, from my religious perspective, it is only with these higher order interpretive understandings of the world that we can even understand basic science. Evidence from studies in the neurosciences make it clear that there is no such thing as what you might call "raw data", uninterpreted sensory input apart from the body and its dynamic of life. There is always an interpretive construct behind apprehension of anything; the inner mind shapes our very act of looking outward at the world. That which we see of the world is shaped by the questions we ask of the world and by the picture into which we try to place the pieces. The story we put around the world, as we gain in depth of apprehension and understanding, is an interpretive story, which further guides our inquiry into deepest reality.

To take the loop just one little step farther, I want an answer that takes account of those things which we know, not just through scientific method, but which we know by a fuller and richer intuition that is not necessarily easily put into terms of reductionistic, deterministic, materialistic language. I don't think science is limited to this language, by the way, but these are the main tools of our time. I want an understanding that integrates the significance, for example, of suffering into a meaningful understanding of the cosmos. I think only then will the whole phenomenon of materiality make any sense to us.

For it is an inescapable fact of our embodied lives that they are pervaded with suffering, and that suffering poses an enormous challenge to our quest for meaning. My perspective on suffering is as follows, and it is based on the ultimate theological context in which I live both my science and my religion. Our human embodied existence provides the canvas of communication and the means of communicating that makes possible the ultimate revelation of love through an embodied God. My religious belief is that God was incarnate in Christ, and that, that was a moment when God was, as true as any fact, in the world in the form of a human person; he revealed the fullness of God, at least the fullness that human beings are capable of apprehending. There within chemicals come to consciousness, within the human form with its capacity for genuine communication, moral truth was revealed in matter; the image of God was borne within a body. In the face of Jesus, we saw the face of love, and most specifically in Christ's suffering. Here was the righteous one taking upon himself all the evil and suffering of the world, in order that God might be toward us merciful as well as just. Jesus did not give us a full explanation of suffering, but a demonstration that God cares to the depth of what death means. In this, the transcendent was revealed in and through the immanent, nature and God were joined and the cosmos was restored in its intelligibility.

Now I will address the posed questions.

1. What is your definition of science and of religion?

When I consider definitions of science and religion, I like to start from the perspective that the intelligible order and beauty of the spiritual within the material is essentially what science and theology study when they join together in the very deepest inquiry. All the scientists I know of any depth, acknowledge that there is almost a spiritual element of beauty in science. And that means there's an ethical component. What is the ethical if it isn't the good, the beautiful and the true? And what are the good, the beautiful and the true, if not an extension of life itself, both biological and spiritual? Both science and ethics involve a kind of dynamic of discovery, a dynamic of the expression of freedom, and possibility, and the sprouting of being born that's implicit in both the Greek and Latin roots of the name of nature itself.

There is some immaturity in a view that science is somehow a purely objective course of knowledge. Science itself rests on mythic and improvable assumptions. That's undeniable. Among them is the assumption of a uniformity of principles across time and space, a presumption of order; another one is the presumption that we can intelligibly discern this order. Science itself is a process, is a product of a much more profound process that is made possible by interpersonally shared integrative being. I think science itself is the amazing process and product of this profound convergence into personhood and communicative sociality, of emerging shared consciousness and the filtering process that interactive dialogue allows. Communicative sociality allows a constant counterpoint and corrective that produces a shared knowledge that is deeper and richer than our own individual knowledge. But I don't see it as a knowledge that is incompatible with other types of knowledge.

Nevertheless, in pursuing the intelligible order and beauty of the spiritual within the material, science seeks a natural explanation of things; so we seek to understand how the fullness of existence is embedded in and revealed through natural process. There's no easy answer to this, of course, but this struggle to understand the relationship between the immanent and the transcendent is an effort of major importance (particularly in our age of biomedical technology). In its methodology and in its explanations, science is systematically naturalistic; and its theoretical constructs must be tested empirically against experimental or historical data of natural phenomena.

Religion, on the other hand, looks beyond the natural processes themselves to discern the ultimate meaning, purpose and significance in them. It seeks to express that significance in the context of an overall interpretive story of the drama of life, and in ethical norms that arise out of that significance. And it seeks to celebrate that significance and affirm those norms in ceremonies of communal participation. For me, spirituality means an alignment with the deepest principles of life, and that includes what we can know through both science and the broader interpretive understanding of religion.

2. Do you see any conflict between your definitions of these two concepts?

I do not see any necessary conflict. One elucidates natural process; the other elucidates questions that transcend science, such as ultimate meaning in the drama of life. Ultimately, truth is a unity, though our partial knowledge may leave us with the misimpression of conflict.

3. Where do you think there may be a conflict between these two?

4. What have been the grounds for the development of conflict between these two?

I will answer (3) and (4) together as I comment on some areas of perceived conflict and explain why I do not think the conflict in any of these areas is necessary.

Science is grounded in observational data whereas religion is grounded in a more comprehensive intuitive understanding which may include an assent to sacred and authoritative writings. Scientific data are interpreted in accordance with public consensus in the scientific community under skeptical and logical criticism. In religion, sacred writings might, likewise, be subject to logical theological analysis as well as insight regarding their historical origins and context of interpretation. However, the interpretive story and the higher order meaning, purpose and significance to life expressed in the sacred writings, though consistent with reason, are the subject of passionate personal commitments of faith that transcend skeptical and logical criticism.

Conflict arises when science claims that its empirical-critical methodology is the only valid epistemology. First of all, there is some immaturity in a view that science is somehow a purely objective course of knowledge. Science itself rests on mythic and improvable assumptions. Among them is the assumption of a uniformity of principles across time and space, a presumption of order; another one is the presumption that we can intelligibly discern this order. Secondly, such a position effectively denies the reality of the notions of ultimate meaning, purpose and significance, and likewise denies the possibility of any sort of miracles or divinely revealed truth, since such categories are inherently outside the scope of the scientific methodology. But when science restricts itself to its proper sphere and humbly addresses its limited task this conflict evaporates conceptually.

While the methodological conflict may evaporate, there may remain a perceived conflict in formulations. Recall that I portrayed the emergence of moral and spiritual concerns as a phenomenon arising in that part of nature that is human. As a phenomenon of nature, I argued that it was a legitimate subject of scientific investigation, albeit using novel approaches appropriate to its subject matter. As science develops naturalistic explanations for such higher order human processes, these explanations may appear to conflict with the formulations expressed in sacred writings. For example, science may construct a medical model of sociopathic behavior in terms of genetic, gestational, and early childhood influences whereas religion may subject such sociopathic behavior to moral accountability under human freedom.

But science cannot yet make definitive predictions of individual human behavior in a way that rules out the reality of free choice operating at some level. Moreover, due to the limited ability of science to study unique individual events, there are reasonable grounds to expect that in principle science never will be able completely to rule out the reality of free choice. And in its formulations, science needs to take into account the real phenomenon of human aspiration toward the ideals embedded within the human person's cultural story, as themselves natural processes that emerge in a higher phenomenological level that cannot be properly analyzed reductionistically. Thus, there is room to suspend judgment with regard to perceived conflict in formulations because of possible alternative scientific interpretations.

There is also room to suspend judgment with regard to perceived conflict in formulations because of possible alternative interpretations of religious texts. In the above example, it might be possible to interpret a religious text to allow for tempering justice with greater mercy in the case of a sociopath who grew up in a horrendous childhood environment. Thus, instead of conflicting, science and religion may serve each other by clarifying how to interpret each respective formulation.

However, many conflicts in formulation seem more problematic, particularly at the interface where science and religious texts purport to describe the same phenomenon by natural process and by supernatural agency, respectively. For if one believes in the efficacy of prayer to God, for example, then some divine influence on earthly affairs would seem necessary. Another example would be the purported action of demonic or satanic beings in the world. Miracles and unique events would lie outside the scope of science. While each age seems to have its own cultural disposition regarding such possibilities and events (and some may be more aligned with the truth of things than others), it is clear that our science is too incomplete to make definitive declarations regarding these realms.

Conflict also arises when religion repudiates the empirical-critical methodology of science in favor of uncritically extending the faith commitments of religion into all aspects of life. Some with religious beliefs, for example, might be reluctant even to adopt provisionally the naturalistic methodology of science because it feels to them like a temporary abandonment of faith. As another example, one who believes that it would be a betrayal of faith to question his religion's interpretation that chapter one of Genesis teaches a young earth creation might be unwilling to consider the conclusions of modern geology.

An approach to resolving such conflicts would be to emphasize that the naturalism of science is simply a methodological tool that does not at all address the nature of ultimate reality. Used as a tool in this manner, the method is theologically neutral. The fact that some types of scientism claim that the method is ultimate does not prevent a religious person from using the method otherwise, since such claims of ultimacy are not scientific. Another approach within the worldview of the religious is to emphasize that studying the created order can be an affirmation of faith in a Creator. And using one's mental capabilities to understand that order would be honoring to the God who gave those capabilities; and to neglect to use them might be dishonoring to God. Since I personally believe that truth is a unity and it is God who gives it, I have no fear to subject both science and religion to the deepest scrutiny.

In saying that the above types of conflict are not necessary, I am referring to logical necessity. Conflict may still remain for personal reasons, such as an individual's repugnance at being subject to the authority of religious writings as "revealed truth" or an individual's fear at having the security of his or her religious system threatened by scientific formulations; but such conflict is not between science and religion *per se*. Such personal conflict may result in a form of a scientism, in which scientific formulations are elevated to the status of religious commitments, resulting in a dogmatic naturalism. Such personal conflict may also result in a form of religious fundamentalism in which religious texts are misconstrued as presenting scientific formulations, resulting in dogmatic pseudo-science. Again, important as these conflicts are socioculturally, and needful of resolution, they are not inherently conflicts between science and religion.

5. What has been the role of religion in the development of science in the West?

Conceptually at least, one can identify elements within biblical theism that might potentially have had an influence on the rise of science in the West, both in removing certain impediments to modern science contained in Greek philosophy and through certain of its own characteristics that might have been positively encouraging to a development of modern science.

To begin with, in the greatest possible contrast with certain ideas held among the ancient Greeks, the God of the Bible is spirit, wholly other than God's creation even as He is both transcendent in His being and immanent in His works. Therefore, He always acts as artificer and never as begetter of His creation. Nature lacks the inherent efficacious power assumed for it in these naturalistic views; and as an immediate consequence science must seek not final but solely the efficient causes characteristic of modern natural science.

Furthermore eternally self-existing, omnipotent, free and sovereign, the God of the Bible is not limited in His artificing by any pre-existing forms or matter. He is able to create *ex nihilo*. For His creation to be humanly intelligible, however, it must not be wholly contingent but governed by law; and yet this law cannot limit God's omnipotence as the pre-existing forms limited Plato's Demiurge. Therefore, in creation God first established law, e.g., the wisdom of Proverbs 8:23, and subsequently created the world on the basis of this law. Because this law is not external or prior to God, His omnipotence is not contradicted. Because this law is a product not of God's will but of His understanding, complete contingency in creation is avoided.

Subject thus to reason (law) the physical creation is intelligible to human reason, created in the image of God's reason. And like God's reason, man's is also able to develop from within itself intelligible ideas, by a process of meditation. As with the Greeks therefore, modern natural science also has an *a priori* component, though it is formulated in terms of efficient causes and their expression as mathematical laws governing cause/effect relationships between objects, instead of the Greek focus on final causes expressed in terms of ultimate essences of the objects themselves.

Because God also creates and sustains His world through means He created, human arts are actually mandated. On this basis, together with the reality of matter and exactness of its laws, the world itself is a proper object of study experimentally as well as theoretically. Experiment is thus legitimate as well as necessary, in contrast with the Greeks, and sense perception is able to serve as true and even crucial empirical evidence.

On several counts, then, characteristics of nature presupposed by modern natural science are both consistent with those of a creation that is the work of the biblical Creator and inconsistent with characteristics of nature implied by Greek philosophy. The question then is whether biblical theism was an historically necessary condition for the rise of modern natural science. (That it was not a sufficient condition is evident in the lack of science among the ancient Hebrews, and in the early Christian teaching of the priority of eternal over temporal concerns that contributed to an overall tendency to assign only secondary importance to a study of nature.)

It appears to be difficult, however, to substantiate explicitly that biblical theism was such an historical necessity in the operating worldviews and actual practice of Western scientists prior to and during the beginnings of the scientific revolution, though certain later scientists such as Robert Boyle did explicitly articulate Christian presuppositions. Instead, the rise of modern natural science appears to be a complex phenomenon involving the interacting convergence of many conceptual and social influences. Socially, for example, the rising economic status of craftsmen increased the dignity of manual labor and thus of experiment. And cross-fertilization between a rising technology and pure science was stimulative to both endeavors, which were also stimulated by rising population and affluence. That the scientific revolution came so rapidly to dissociate itself from any debt to biblical theism argues that biblical theism may have served primarily a transitional role to displace inhibitory Greek views rather than positively forming a conceptual base for modern science.

6. Can we have a religious science?

The phrase "religious science" might be interpreted in a variety of ways, for example as: (a) science that is treated as a religion or religiously; (b) an attempt to formulate religious teachings in scientific terms; or (c) scientific study of religion as a phenomenon via the neurosciences, psychology, sociology, etc.

According to the manner in which I have characterized science and religion, I would regard as inappropriate any attempt to elevate the content of science into statements about ultimate and absolute reality. Such a practice is described by the term scientism, and an example of it would be the extreme mechanistic view that reality consists in nothing more than matter in motion according to physical laws. Similarly, I would regard as inappropriate any attempt to formulate in scientific terms notions that properly transcend science, such as views of the meaning, ultimate purpose and significance of life, and divine action in the world.

It should be clear, however, from my introductory paragraphs that I regard the scientific study of religion as a natural human phenomenon to be very appropriate and possible, even though such study will never provide an ultimate account. To the extent to which religious phenomena represent an emergent phenomenological level, novel scientific methods appropriate to such a level will be needed to investigate them in their fullness.

7. Can science dispense with religion?

8. Can one separate the domains of activity of science and religion completely?

I will answer questions (7) and (8) together.

"Dispense with" might mean "supercede" or "operate without reference to". That science cannot supercede religion follows from my criticisms of possibilities (a) and (b) in question (6). Science as a programmatically naturalistic methodology may operate without reference to religion in everyday practice. The scientist who is also religious might pray for insight, safety or courage during his scientific undertakings, but that would not be part of his scientific methodology *per se.*

However, there is a sense in which I think science cannot and should not ultimately operate without reference to religion nor should science and religion completely separate their domains of activity. This is so because science itself must be seen as a product of a larger intellectual history, as culturally constructed, if we are to keep from being swallowed by it. Reductionism is a methodological tool not an avenue toward ultimate description. Whatever the physicists may mean by a "Theory of Everything", it is not a full description of reality. Ultimate reality is never finally described in simpler terms than itself: the universe is what it is. Integrative scientific theories, such as the theory of evolution, can illuminate everything from basic genetics and biochemistry all the way up to whatever evolutionary psychology and that type of inquiry can yield. But even theories such as evolution only exist within a more fundamental philosophical or theological understanding of the world.

For example, aesthetic intuition is in the service of survival, but it also turns back on itself as a meaning for which we live. Evolution employs means that become ends in themselves. Without that one little last loop in the process, you get lost in evolutionary thinking, where the intermediate organism has no significance but the larger life trajectory does. All the way up it seems like evolution is about the process, but with personhood it seems like it is about the product. It is as though the last move turns the whole thing inside out – like a woman sowing a pillow. She sows and sows and the stitches all show but its beauty is evident only on the last move when she turns it all inside out. At the last move in the motions of life, matter becomes meaning and process becomes personhood.

Religion, on the other hand, must be related via science to our embodiedness and our connection with the whole natural world in which we live, especially where religion and science are investigating the same phenomena. In our search for both mechanism and meaning, science and religion are complementary approaches to the phenomenon of life.

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1. What is your definition of science and of religion?

My definition of religion is necessarily based on my faith, Islam. Accordingly, religion is a set of beliefs and accompanying practices ordained by God through His Prophets, the first of whom was Adam and the last was Prophet Muhammad, upon them all be peace. All religions based on revelation have certain common elements: belief in the Creator, His Messengers, life after death, Day of Resurrection, and an ever-lasting life in one of the two places in the Hereafter: Paradise or Hell. According to the Qur'an, the knowledge of the Creator resides in the inner most recesses of every human being. This Divine imprint is the result of a primordial covenant all human beings established with the Creator in pre-eternity, when He asked them, "Am I not your Lord?" This primordial covenant (*mīthāq*) is the central principle of all religions. It is a covenant between God and all human beings.

Any attempt to define "science" is a time-bound exercise. What the word means for us today is different from what it meant to a resident of Rome in the sixth century or a resident of Baghdad in the 10th. Thus, "science" has meant different things to different people at different times in human history. For the purpose of our discussion, I would like to define it in its contemporary post-Cartesian sense: a systematic study in the form of testable explanations of the observed phenomena. This science emerged in Western Europe in the late sixteenth and early seventeenth century and then developed and expanded to include all branches of science and all regions of the planet. In this historical sense, science is not an idealized investigation of nature for any higher goals; it is a commercial enterprise of enormous consequences for the entire world.

2. Do you see any conflict between your definitions of these two concepts?

Defined in the above sense, religion and science have an overlapping area related to "origins", where both provide explanation of observable phenomena through their own perspectives which are inherently in conflict with each other in this realm, and there is another sphere where they do not interact and therefore, the question of a conflict does not arise.

The conflict between the two is related to the question of "Origins", a question which is fundamental to all aspects of life and knowledge. This conflict in religious and scientific explanations of the origin of cosmos and life has been expanding exponentially since it first appeared in Western Europe and especially since the mid-nineteenth century.

There are various facets of this conflict in various religious traditions. Historically, the conflict arose between Christianity and modern science in its formative period; the most notable example being the Galileo affair which began around 1610 and culminated with the trial and condemnation of Galileo Galilei by the Roman Catholic Inquisition in 1633. This is, however, not an isolated example, nor is it a simple case of one religious authority trying to impose its dictates on scientific inquiry. It was a complex issue, but it did set the stage for the emergence of modern conflict between Christianity and science. In the nineteenth century, Darwin played a critical role in further developments of this conflict.

This specific case of one religion coming into conflict with an emerging scientific tradition was later imposed on all religions and attempts were made to investigate the question of science and religion through the same theoretical models of discourse which emerged from the Christianity and science conflict. Significantly, this imposition of a specific framework of discourse has given birth to false terms of inquiry in the case of Islam. The relationship between Islam and science needs to be re-examined through a lens that is rooted in Islam's own historical situation with regard to scientific inquiry as well as its own worldview.

We also need to recognize that contemporary science explores only a small domain of what exists, both in physical and non-physical senses. There are numerous regions of existence which remain outside the reach of science. The study and exploration of the small subset of Reality by science is also constrained by the human-centred epistemology which governs this study. Thus, science today is not only in conflict with religions, it is also in conflict with itself as it attempts to seek more power, economic benefits, and control of nature and natural resources for a privileged few at the expense of humanity at large.

3. Where do you think there may be a conflict between these two?

As already mentioned, the fundamental conflict between contemporary science and all Divinely revealed religions is in their mutual exclusive accounts of the origins of cosmos and life. This foundational conflict then expands to other realms: If there is a Creator of the Cosmos and all that exists in it, human beings have an inherent relationship with the Creator and, thus, need to follow His commands. Yet, since science today claims that it has no need of God, it attempts to study and explore all existing things as if they have come into existence without a Creator. It needs to invent its own morality, raison d'etre of existence and so on. Consequently, the resultant conflict spans all realms of our understanding of who we are, what is the nature and purpose of existence, who created what exists, where are we heading, what is the ultimate destiny of the created beings and the like.

Specifically, the conflict becomes more apparent when we ask: How and when the cosmos came into existence? Where is it going? When did life appear? How? Is there a teleology? It is through such fundamental questions that we come to a fuller realization of the mutual exclusiveness of modern science and revealed religions.

4.What have been the grounds for the development of conflict between these two?

To be historically correct, we must grant that the grounds for conflict between these two are not new: religious worldview has always been opposed by man-made notions ranging from the eternal, ever-present existence, to creation being the work of gods or time *(dahr)*. However, in various ancient man-made cosmological schemes, biological origins remained a rather ambiguous area. To ascribe the origin of lifeless matter to Nature, time or gods is easier than construction of plausible theories of origin of life.

Modern science, however, boldly proclaims to have answer to the question of origins; not only that, it also claims to be the only legitimate way of knowing the answer. This has been accepted by the dominant civilization of our times and hence the conflict between religion and science has moved to a new ground. On this new terrain, religion has been losing ground. Each new discovery and success of science further established its claims. By the end of the twentieth century, science had gained such authority that no other worldview could compete with it; this has been true for a very large number of people on this planet, although most Muslims have not accepted answers provided by modern science with regard to origins.

In 2020, science suddenly found itself at the heart of an unprecedented challenge in the form of a virus. While Covid-19 has challenged science, it has, nevertheless further entrenched its role as political leadership in most countries has appealed to the authority of science and scientists for managing the virus and finding a cure for it. This reliance on science in dealing with an unprecedented existential challenge has further raised the status of science.

5. What has been the role of religion in the development of science in the West?

Religion has played two important roles in the development of science in the West. First, it provided the initial institutional structure for the emergence of modern science through its organized monasteries and schools. It was precisely these religious institutions through which Islamic scientific tradition—which carried within its bosom fruits of eight hundred years of reflection and refinement of Greek, Persian and Indian sciences—reached Western Christendom. We know that it was a Benedictine monk of Monte Cassino, the famous Constantine the African, who in the 11th century produced a paraphrase of Galen and Hippocrates from the medical encyclopaedia of the Persian Haly Abbas (d. 994). Further, let us recall that the first center of translation of Arabic texts into Latin was Toledo that fell to Alfonso VI in 1085 and where, in the 12th century, a great number of Arabic books were translated under the patronage of its archbishop.

Thus, Christian religious institutions nursed the baby of scientific reawakening of Europe but once it was sufficiently robust, religion played another role: in a failed attempt to keep science within its control, Christian authorities tried to suppress autonomy to scientific inquiry. The resultant conflict drew battle grounds. Over the course of time, science won its freedom from the Church. This dual role of Christian religious institutions first led to a divorce between science and Christianity and then science became a pseudo religion itself.

6. Can we have a religious science?

Since there is only one kind of science left on the planet, and that science clearly does not have any room for God, then the answer is no, at least in the foreseeable future. To develop another kind of science seems impossible at present. Even though there is a growing amount of scientific data which points to a Creator as well as limitations of human ability to know about the origin of cosmos and life, contemporary science is so contemptful of the very idea of God and has a blind faith in itself; hence, it does not seem possible to have a "religious science" in the foreseeable future.

7. Can science dispense with religion?

I think it has already done so. Now the question is whether it can live with this dispensation. The way things are, science without religion is the force that is now shaping the world and its governing structures. No matter what happens, the basic structure of the world seems to rest on the notion that ultimately science will solve all problems. This defies human experience but no matter how many new calamities and disasters emerge, political leadership seeks to resort to the science for solutions. The degradation of the natural environment, emergence of new diseases, pandemics, economic disparities and the like do not seem to produce any corrective.

8. Can one separate the domains of activity of science and religion completely?

Yes, in fact, it has already been done, both in the West and in the East. Modern science has successfully bifurcated the domains of activity of science and religion. Hence, we have compartmentalized human beings – people who go to their laboratories leaving their God in the mosque or church. Most human beings do not even know how to retain both activities within their own beings and work environment.

Consequently, there is a great deal of tension between scientific and religious activity within each life. For most people, the easiest way to cope with this tension is to keep these two activities in separate compartments. The structure of the enterprise of science makes it possible to keep these two activities separate, at least in a superficial way. As a result, a religious person can go to a laboratory and do research to produce the most lethal weapons or work on inventions which would desecrate the natural habitat without carrying any guilt. This is so because he or she is not even aware of the significance of the tine segment of a large research project which is consuming his or her life in the overall scheme of things. Department of Defence or a pharmaceutical giant funding this tiny little segment of research does not disclose that its results will be utilized to develop lethal weapons or proprietary medicine. Hence hundreds of innocent scientists are busy in very dangerous research.

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1. What is your definition of science and religion?

When it comes to science, I mostly follow the common sense Anglo-Saxon definition that understands science predominantly as natural sciences, the endeavor to understand nature with (well-defined) scientific methods.

Religion is a very broad concept which has been defined in various ways. Religion is basically about relationships: to God, other human-beings, the rest of nature/creation, myself, tradition, history and future.

I find it important to distinguish between religion and theology. By theology, I mean the critical and self-critical reflection on the contents and effects of a religious tradition. As a Christian theologian my main reference in the following is the Christian tradition.

2. Do you see any conflict between your definitions of these two concepts?

At the beginning of the third millennium we have realised that the story which so often has been told about science and religion, the story of fierce and constant warfare, definitely is a false one. Two books which appeared at the end of the 19th century – *A History of the Warfare of Science with Theology in Christendom* by Andrew Dickson White, 1896, and *History of the Conflict Between Religion and Science* by John William Draper, 1874, – have contributed to the misguided view that science and religion should be doomed to a never-ending conflict with each other. However, the relations between science and religion – the two powers which to such a high extent have shaped our cultures – have been much more complicated and more ambivalent than that. Both Draper's and White's books represent an attack on institutional religion rather than a serious discussion of substantive issues. They attack theologians and certain forms of ecclesiology rather than religion as such. On the whole, they are less aggressive than the titles suggest.

Historian John Brooke, who also contributes to this book, is one of those who have shown that the history of science and religion is rather complicated with lots of influences in both directions. Theology has influenced the development of science, and science has had an impact on the development of theology. Both enterprises have very much of a common root: namely the desire to understand what nature/creation is like.

Emphasizing the interaction between science and religion does not mean, of course, that there cannot be any tensions. Fed at the bosom of the church, emerging science went through a stormy period of adolescence in order to start an autonomous grown-up-life. As all processes of emancipation and liberation, also this one was accompanied by conflicts and misunderstandings. The revolt of science against church authorities was a scaring experience for many theologians. No wonder they tried to rescue an area of their own – the inner realm: Nature and objectivity to the natural sciences, the inner life and subjectivity to theology. This solution avoids conflicts by separating parts and partners from each other: the spirit from the body, nature from culture, the human from the rest of creation, time from eternity, the public from the private etc.

It has often been held that German theologian Friedrich Schleiermacher (1768-1834) was a proponent of this position separating subjectivity and objectivity, religion and science. I do not think this is the whole truth, but be that as it may, this kind of peaceful divorce may have been a good solution for a certain period of time. However, it is certainly not the kind of state we would like to preserve. In a time where technologies pose numerous ethical questions, where neuroscience teaches us ever more about how religious experience works – to mention only two examples –, it would be anachronistic indeed to claim that there is no need for a science-religion-dialogue.

Although research in science-and-religion has done a lot to revise the false image of conflict and to give us a more authentic picture of the historical development, the myth of conflict seems to be surprisingly tough and very much alive in popular understanding.

A student of mine once conducted a comparative survey of Swedish high school textbooks in religion from the point of view of science-and-religion. Many of these textbooks did not care to address the issue at all, which is rather surprising if one thinks of science and religion as the two powers that so deeply have influenced world-views and cultures. And those authors who chose to discuss the issue mostly took conflict for granted as the only possible relation - quite often representing a rather blunt anti-clericalism and/or scientific positivism. If there are no better tools available to help future scientists and engineers to form a comprehensive and consistent worldview including religious perspectives and commitments, this is indeed an alarming perspective.

3. Where do you think that there may have been a conflict between the two?

Just as children have to struggle their way through adolescence, the natural sciences had to strive for their emancipation and autonomy. Commonly, Galileo's conflict with the Catholic Church and Darwin's theory of evolution are presented as the classical clashes between science and theology. Cosmology and evolution both presuppose the concept of "deep time", whose counter intuitiveness – given the limitations of a perspective that is intellectually and emotionally informed by the length of a human lifespan – complicated the acceptance of this new knowledge.

The impression that there was a univocal religious outcry against progress in science that was only gradually modified into more friendly relationships is a false one, however. Dissent often expressed a critique of institutions rather than of ideas. In reality, in response to the so-called Copernican revolution, as well as in response to the theory of evolution, Christian scholars adopted from the beginning a wide variety of strategies.

4. What have been the grounds for the development of conflict between these two?

Without claiming to be comprehensive, I mention some factors that can foster (unnecessary) conflict between religion and science:

- A failure to understand scientific theory in its proper context: for example not being able to understand "deep time", i.e. the immensity of the time frame presupposed by the theory of evolution.
- A failure to understand what "theory" means in science, namely an explanation/law as well-tested as could be; the truth as it is knowable at a certain point in time – and not, as for instance critics of evolution tend to assume, "just a hypothesis among others".
- Proneness to understand science in terms of scientism: everything there is worth knowing can be known by (natural) science; scientific fundamentalism.
- Unwillingness to undertake the hermeneutical task of interpreting holy scriptures and religious traditions, resulting for example in literalism and fundamentalism.
- A confusion between methodological reductionism and ontological

reductionism: reducing something to "nothing but" in order to research is different from saying that the essence of everything is to be "nothing but".

- Ignorance about cultural influences on both science and theology: Historians have demonstrated how local settings and dynamics often trump the reception and development of both theology and science; the cultural capital present at a certain time or in a certain place sometimes funds things that are beyond the influence of science and theology *per se*.
- Falsely equating science with modernity and modernity with secularism: where modernity goes in, religion goes out, hence the more science advances, the more religion will decline. Research in sociology of religion has proven these to be false assumptions.

5. What has been the role of religion in the development of science in the West?

The history of the relationship between theology and the natural sciences in the Western world is not unlike the dynamics of a growing family. In medieval times, theology was the queen of sciences. In the 13th century, Thomas Aquinas created a powerful synthesis of the best knowledge about religion, philosophy and nature. His principal resource was the philosophy of Aristotle, which had come to Christian Western Europe thanks to the high standards of Muslim scholarship. Christian theology in and of itself also inspired scientific inquiry. Where God is understood as the creator who has endowed the cosmos with order and humans with creative rationality, inquiry into how the cosmos works can indeed become a way of worship. Reading and understanding both "the book of scripture" and "the book of nature" can be noble and necessary enterprises. In that sense, early modern science was very much a child of theology. Quite a number of the pioneers of modern science were close to theology or the church. When Johannes Kepler formulated what has become known as his third law of planetary motion, he felt "carried away and possessed by an unutterable rapture over the divine spectacle of the heavenly harmony."

A positive appreciation of the natural world is part of Christian tradition. The natural world is a gift. In fact, according to Christian anthropology, we should regard as a gift not only nature as such, but also our knowledge about nature (science) and the technology we have developed – although in a critical manner, not naively, since it all works within the framework of sin and salvation. Some biblical key passages in this regard are Wisdom of Solomon 7:15-30, Job 12:7-10 and Romans 1:20.

Christian tradition is gifted with a high appreciation of intellectual capabilities combined with a sense of mystery. This is a very good combination for seeking literacy, both in faith matters and in science matters. Therefore, I see a continuous role for science-and-religion dialogue in helping intellectuals of all disciplines to form a well-integrated, constructive worldview. In this dialogue, theology is both at the receiving end and at the giving end.

A stanza from a hymn by Frederick Pratt Green (For the Fruit of All Creation) summarizes a good religious attitude.

For the harvests of the Spirit,
thanks be to God;
for the good we all inherit,
thanks be to God;
for the wonders that astound us,
for the truths that still confound us,
most of all, that love has found us,
thanks be to God.

Through the eyes of faith, God is not known to us primarily in terms of divine action (or intervention) in the natural world but in terms of trust. Our relation to God is not built upon understanding how divine action works in the natural world but on the answer to the question: In whom do you trust the most? This, of course, does not rule out our desire to understand how God acts, but the focus is a love-relationship with God. That is the difference between faith understood as *fides*, belief, and as *fiducia*, as trust. In other words, it is about "God for us," not about an abstract theism. It is about God who calls you, me and the cosmos toward fulfillment, not about a remote supernatural being.

One of the Christian formulae that try to describe the presence of Christ in the Eucharist applies quite well also to the notion of divine action in the world. As we can think of Christ being present "in, with and under" bread and wine, so we can imagine God acting in, with and under or through the natural order of our world. The "in, with and through" provides an open answer, in the light of which we can live with confidence, facing unresolved issues as well as diligently and daringly exploring those "wonders that astound us" and "the truths that still confound us" – scientifically and existentially.

Cosmology forms an important part in the dialogue between science and theology. The cosmos not only has history; it is history. Looking out in space is looking back in time. The dialectics of knowledge and ignorance, the link to metaphysics and speculation, all instill a sense of humility, wonder, awe, poetry and contemplation that connects the universal with the existential.

Science cannot heal the eternal wound of existence, as Friedrich Nietzsche observed in the 19th century. "Our whole attitude toward nature, the way we violate her with the aid of machines and the heedless inventiveness of our technicians and engineers, is *hubris*;" he complained. "... We violate ourselves nowadays, ... we nutcrackers of the soul, ..., as if life were nothing but cracking nuts." Even theology can lend itself to hubris and nut cracking. Engagement with cosmology can be mutually beneficial in preventing science from the excesses of positivism or scientism and religion from the decline into speculation or moralism.

Maybe the Norwegian writer Jostein Gaarder has got something right (the idea rather than the number!), when he has one of his characters remark "The applause for the Big Bang was heard only fifteen billion years after the explosion." Aren't we in the middle of that applause?

The task of interpreting our knowledge remains. The time-honored theological task of *fides quaerensintellectum* – faith seeking understanding – is a task as arduous and rewarding as ever.

6. Can we have a religious science?

No, not in the sense that a certain religious tradition directs what kind of research is done and how it should be pursued. However, scientists do well in acknowledging that they always build on pre-empirical assumptions. As we remember, Einstein saw a religious commitment in the acknowledgment of the astounding fact that the universe seems to compatible with human rationality.

Also, the fact that neither science nor religion do themselves, but are pursued by people who may be scientists and non-believers or believers and scientists, invites reflection and dialogue.

7. Can science dispense with religion?

Yes and no. A particle physicist will plan, do and evaluate her research in the same way, regardless of her being a Jew, Christian, Muslim, Hindu or an atheist. In that sense, science should dispense with religion.

But since science is done by people and for people, it may find itself in a position of having to answer questions emanating from a religious worldview – questions regarding purpose, meaning, social costs and consequences, ethical dilemmas etc.

I also suggest that the experience and expertise that theologians have accumulated in the field of hermeneutics is an asset for scientists. The critical engagement with the art of interpreting and understanding is necessitated by both the potential of scientific concepts of building ideology and the role that metaphoric processes play not only in the communication of science to non-scientists but also in scientific research and teaching.

8. Can one separate the domains of activity of science and religion completely?

Methodologically, we can separate these activities quite considerably. In fact, for the sake of both, we should insist on methodological integrity and respect these areas as areas of knowledge in their own right.

Yet, if we want to understand the world as well as we can, if we ask for a meaningful and consistent worldview and if we take responsibility for the ways of the world, we cannot separate these two fascinating areas of knowledge. One might use the Greek term *eu-tonos* to express this relationship: a beneficial tension in and between two bodies of knowledge.

I have argued from a view that sees science and religion as two of the most influential, if not the most influential, forces that have shaped most of our cultures. Part of their success is the efficacy of faith in knowledge, namely the firm trust in the intelligibility and rational compatibility of the natural world, and the fruits of the knowledge of faith, in terms of both spiritual wisdom and theological analysis. Therefore, I want to understand the relationships between religion and science as a beneficial triangle drama between faith in knowledge (science), the knowledge of faith (religion and theology) and their common responsibility for the world.

As in all dialogues, so also in this triangle drama: mutuality is required, although not always taken for granted. A secular scientific context tends to expect theology to listen and learn rather than to consider and contribute – turning mutuality into a reality yet to be claimed.

So far, the main ambition of religion-and-science dialogue has been to make things intellectually fit. Much energy keeps being invested in the effort of finding a coherent and adequate language that does justice to the progress of science, while at the same time allowing for the communication of a religious worldview, and rightly so. Yet, making things intellectually fit is necessary, but not sufficient. In the end, intellectual coherence will only reach halfway.

People want and need to see that things fit spiritually, too. This is a hard challenge to meet, however. It is easy to err, both on the side of spirituality and on the side of rationality and thus to build in distortions of science or religion or even of both from the very beginning. Some proponents of spirituality misuse science to "prove" things that lie outside the realm of science. Proponents of rationality sometimes operate within a rather peculiar paradigm, where the level of defeat of religion serves as an indicator of the progress of cultural evolution in humankind. None of this would appeal to an intelligent, well-educated person in search of wholeness that provides space for both rationality and spirituality and allows philosophy, science and theology to cross-fertilize.

It is indeed difficult to do justice to the full integrity of both rationality and spirituality. However, the situation is not hopeless. Even though emphasis has been on the intellectual perspective, the last thirty years of dialogue between religion and science have also generated concepts and models that have the potential of making things fit not only intellectually but even spiritually. I see that potential for example in Philip Hefner's concept of the human person as a created co-creator and in Ted Peters' and Martinez Hewlett's attempt to develop a theology of evolution that can serve not only as an effective rebuttal of Intelligent Design and creationism, but also as a catalyst of hope.

In days to come, the dialogue between religion and science must become both intellectually and spiritually fit in ways that surpass what we have so far. In order to make a difference, this dialogue must be vital in the academic world, but it must also reach out beyond academia into the public spaces of religion and society.

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Teaching: Gadjah Mada University: Faculties of Medicine, Biology, Cultural Sciences, Philosophy, Graduate Studies (bioanthropology, evolution, paleoanthropology, medical anthropology, natural sciences in philosophy, peace and human security).

Publications: 300 papers and books in above-mentioned disciplines, and anatomy, vertebrate evolution, medical and higher education, scientific writing, polemology, panetics, biopolitology, bioethics. Books a.o. (in Indonesian): *Man, Science and Technology; Towards Humane Technology; Biological Anthropology: Reader and Text; Polemology: A Study of War and Peace; Futuristics: To Anticipate, Choose and Change the Future.*

1. What is your definition of science and of religion?

Science is a system of knowledge obtained by means of interpreting collected facts and information, logically argued and publicized, and accepted by consensus of the scientific community. Science consists of natural sciences, which concern natural objects and phenomena, and socio-cultural sciences, which concern man-generated or man-modified objects and phenomena. Science involves the process, the products and the scientific community.

Religion is a system of beliefs which guides human beings in worldly life and after-life based on the interpretation of scriptures of the Holy Books or on traditional oral wisdom and cosmology of the adherents. The abidance and practice of religion are most frequently ritual and less frequently moral.

The interpretation of scientific raw data and religious textual data changes through time, both in grand scientific theories and religious tenets.

2. Do you see any conflict between your definitions of these two concepts?

Theoretically there can be no conflict possible between science and religion as defined above, but there are potential conflict areas, such as the origin of man and the evolution of living beings. Major conflicts may arise if science tries to explain the doomsday and after-life, or if religion tries to explain e.g. the aetiology and mechanism of diseases or the nature and behaviour of matter. Fanatism on either side may result in irrational conflicts.

3. Where do you think there may be a conflict between these two?

Religion begins and ends with *prima causa* or the ultimate concern. Everything has the same origin or cause and life's only purpose is to serve the Almighty. Science tries to understand the causes, mechanisms, results and diachronic changes in natural and cultural phenomena, in other words the ways God creates everything in the universe.

4. What have been the grounds for the development of conflict between these two?

Grounds for conflict between science and religion are among others:

the antiquity of creation of the universe and anthropogenesis.

the present man as the ultimate creation and controller of the earth.

the expanding kingdom of God, from local and tribal gods to God of the Universe; many still believe that God is only the God of the planet earth.

literal interpretation of the Holy Scriptures and overgeneralization in science.

microcreation and micromonitoring involving individual, direct, separate and fixed creation by God *versus* megaprogramming.

unquestionable historical dogmata, such as the universal flood and the sequence of emergence of faunal taxa.

the concept of God, influenced by the image of man and vertebrate bilateral symmetry versus amorphous energy-matter entity.

5. What has been the role of religion in the development of science in the West?

linear in lieu of reticula thinking.

the concept of God as triunity, permeating into scientific thinking.

the propagation of Western science is mixed with and assisted by colonialism and evangelization of European Christian syncretism.

the concept of superiority of the white race, justified by Western scientific arguments, reflected in standards, ideals, etc.

the influence on space and time, e.g.: Near East, Middle East, Far East; Europe as continent instead of subcontinent; the importance of the Mediterranean; the 7-day week beginning with Monday and the Gregorian calendar.

medical oath, and practice of medicine (uniform, symbols, diet, way of life).

6. Can we have a religious science?

There is no religious science, because science is universal; there can be religion-guided science. Science can be religious in application, but not in hypotheses and theories.

Scientific religion is also not possible; religion cannot be explained by science, e.g. miracles, life after death, and food taboos, because scientific truth is only tentative and transient.

7. Can science dispense with religion?

It is possible that science dispenses with religion but dangerous to humanity. Absolutely, value-free and uncontrolled science is incompatible with the survival of man and environment. Religion provides the "don'ts" for science. Life is a chaotic system and influenced by myriads of factors which may have positive or negative impacts on the human mind. One should have faith in life and this is provided by religion.

8. Can one separate the domains of activity of science and religion completely?

The domains of science and religion can be separated only relatively. Both domains are superimposed and separable only for analysis, but in practice we ought to have a holistic view of everything. The superimposition is reflected in e.g. reproduction and marriage, humanics, environmental exploitation, and after-life security.

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Education: Preliminary and introductory Islamic seminary studies in the Ḥawza of Amol (1946-1950). Intermediate studies in Tehran at the Marvi School with Ayatullah Hajj Shaykh Muḥammad Taqi Amoli, Shaykh Muḥammad Riḍa Muḥaqiq-damad, Ayatullah Sha'rani, Ayatullah Ilahi Qumshei, and Ayatullah Faḍil Tuni(1950-1955). Advanced studies in Qum with grand Ayatullah Burujirdi, Ayatullah Muḥaqiq-damad, Ayatullah Mirza Hashim Amoli, Imam Ruḥullah Musavi Khumayni, 'Allamah Muḥammad Ḥusayn Ṭabaṭaba'i (1955-1980).

Professional Experience: Senior professor and teacher of traditional texts such as: Isharat, Sharḥ-i tajrid, Sharḥ-i manẓumah, Shawaāhid al-rububiyyah, al-Taḥṣil, Shifa, all of the Asfar, Tamhid al-qawa'id, Fuṣuṣ al-ḥikam, Miṣbaḥ al-uns, Kharij-i-fiqh, and the exegesis of the Qur'ān (in its entirety). Leader of the Friday prayers of Qum (1990-2009). Chosen by Imam Khumayni to deliver a historical message to Mikhail Gorbachev, the then president of the Soviet Union, in Moscow (January, 1989). Selected by the Supreme Leader, Ayatullah Khamenei, to deliver a message in the United Nations General Assembly building in New York, USA, for the Millennium World Peace Summit of Religious and Spiritual Leaders (August, 2000). Acknowledged by his peers as a master in mysticism, philosophy, theology, jurisprudence and Qur'anic exegesis and renowned for his extensive teaching and writing in these fields, as well as his attention to current affairs and appraisal of modern schools of thought. Founder of Esra International Foundation of Revelatory Sciences (2010).

Publications: More than one hundred volumes of books on subjects such as exegesis of the Qur'ān, hagiography of the Prophet and his immaculate Progeny, philosophy, mysticism, theology, religious law, social rights, religious teachings, and traditions. His exegesis of the entire Qur'an, Tasnim, won the 2006 the Islamic World Educational, Scientific and Cultural Organization Award as the "top research in the field of Islamic and Quranic Studies" category.

1. What are your definitions of science and religion?

As the question alludes to experimental science, the answer will begin with an analysis of experimental science.

Science or knowledge has an enlightening quality with respect to those things that are called 'the known'. It is the disclosure of the reality of the known, and it is this very same disclosure that is the essential desire of man. This is because it is with the general knowledge of the reality of man, the cosmos, and the relation between these two, that the need and perfection of man, along with the way of alleviating that need and the path towards the achievement of that perfection, becomes clear. Without science man can never know his own reality, can never become aware of his own needs, and can never reach his own perfection. Science, by way of a general awareness of *the known*—whether intellectual or sensible, abstract or experiential— and with a summary awareness of its existential modality, arrives at the method of its disclosure and, using this method that is specific to this known, reaches its final desired disclosure. Experimental sciences are those sciences which are acquired by the modality of sense experience. The role of the senses in acquiring the experimental sciences is so substantial that Aristotle believed that if any sense is deficient, certain knowledge must also be deficient"

Despite the importance that sense experience has in the acquisition of experimental science and knowledge, and contrary to the beliefs of empiricists and positivists of the Vienna Circle, experimental science is not attainable within the confines of sense data, and for its existence this science needs knowledge that is non-sensorial and non-experimental—in particular, it needs to make use of metaphysical principles and bases (for instance, the principle that man, the knowing agent, and reality, that is independent of him, both exist, and that it is possible for man to know that reality; or the principle of non-contradiction and that a universal proposition can be nullified as a result of an occurrence of a particular.).

If the a priori propositions upon the basis of which experimental science takes shape, in particular metaphysical propositions, were purely subjective or intersubjective, then experimental or scientific knowledge would lose its realist, objective, and universal identity and would be reduced to nothing but subjective or cultural, social, and historical vagaries. Hence, the truly *scientific* identity of experimental knowledge is safeguarded only when scientific propositions are not limited to sensorial or experimentally verifiable propositions, but rather, pure intellectual knowledge, which is abstract, universal and atemporal, is considered accurately descriptive and illuminative of objective reality and is seen in its revelatory and [true] scientific aspect.

Again, intellectual knowledge maintains its scientific identity only when the intuition of reality is not limited to the sensorial realm, allowing thereby the transcendental and immaterial dimensions of the objective world and human actuality to be properly recognized, and preventing the cosmos and man to be reduced to the natural world.

The omission of the intellectual intuition of immaterial and transcendental realities and the consequent reduction of knowledge and pure intellectual science to rational and conceptual knowledge was what took place in the philosophy of René Descartes. Thereafter, holding knowledge to be subjective and a mental construct while denying the true transcendence of intellectual realities, labelling as "transcendental" concepts that reside in the mind, and restricting intuition of reality to the sensorial "intuition" [of objects] is what transpired at the hands of Immanuel Kant. He put the scientific value of intellectual knowledge with regards to reality on shaky grounds and held that metaphysics should not be counted as a real science and body of knowledge. He went on to destroy the cognitive and scientific (and non-empirical) foundations of experimental science. Empiricists and sensationalists, as well as positivists, in cutting their ties with the intellectual sciences and restricting scientific knowledge to experimental and empirical knowledge, while not being able to establish their claim of [modern science] being independent of non-experimental knowledge, and by reducing pure intellectual and non-empirical knowledge in Kantian and neo-Kantian terms to mental, cultural, and historical phenomena, perforce surrendered the universality and enlightening quality of experimental science with regards to objective reality as well; as a result, in the post-modern narrative, the experimental sciences became a body of knowledge specific to regional-cultural and historical factors.

On the basis of this analysis of experimental sciences, [it can be said that] the experimental sciences maintain their enlightening quality as *scientific* knowledge only when "science" is not restricted to just the experimental sciences but includes intellectual, conceptual, and intuitive knowledge as well.

In Arabic, the word *dīn* (religion), literally means "submission, recompense, and habit", terminologically it denotes a doctrine and a method, or a *way of human life* that corresponds to the divine legislative will. The divine legislative will, founded upon mercy, wisdom and guidance, has mandated a way of life that conforms to the original nature of humans and that is in line with their perfection and felicity. This way of life, informed with true knowledge and good actions, provides man with worldly sustenance and otherworldly salvation, allowing him to gain proximity to the station of being God's vicegerent *(khalifah)*.

Because man has free-will, he can act according to the divine legislative will and submit to divine commandments on the path of felicity, or he can take up the path of rebellion. It is for this reason that the divine legislative will, in contrast to the divine existential will, can be met with rebellion. So, whatever his action, man will be resurrected with it in the afterlife and will get its recompense.

The realm of religion is the realm of human beliefs, practices, and free-will. God wants man to bring into realization what He, in His knowledge, legislates and mandates for him. The realization and actualization of this is within the scope of human acts and behaviour, and human beings realize the divine commandments by accepting and submitting to them.

Religion has various dimensions that correspond to the existential and behavioural levels and dimensions found in man. A part of human behaviour, such as worship and transactions, pertains to his body. Another part, such as faith and belief, pertain to his soul. Some of his acts are individual, while others are social. Religion comprehends all of these aspects of human life and action, and hence in defining religion it has been said that religion is "the totality of beliefs, virtues, and acts of man that correspond to the divine will and command".

The active cause of religion is God, who originated it. The passive cause of religion is man, who accepts it and submits to it; it is for this reason that religion is also called *Islām* (lit. submission), as per the verse:

إِنَّ ٱلدِّينَ عِندَ ٱللَّهِ ٱلْإِسْلَٰمُ

Indeed, with Allah religion is Islām (submission)... [Qur'ān 3:19]

In accordance with the above definition, religion has concomitants such as: its active source (i.e., God the divine originator), its dispensation, and its knowledge. While the senses are effectual in acquiring the knowledge of many things, including religious things, nevertheless the acquisition of the knowledge of religion is not limited to the sensorial and empirical forms. The intellect, revelation, and tradition based on revelation, are the methods by which the knowledge of religion is obtained. Hence, religion is not God Himself, even though the belief in a sacred divine being, which is an inner act of man, is the most important fundament and part of religion, such that without it all religious acts are impaired.

Religion is not the knowledge of God, even though without this knowledge it is not possible to believe in God. Religion is exclusively from God and is affirmed by means of revelation, intellection, and tradition based on revelation.

Religion is a divine tradition whose various dimensions become known with the help of revelation and prophethood, and only after the cosmos, man, and the relation between these two is known. This is because it is not possible for incapable man to become aware of the reality of the above-mentioned triad without the guidance of the Creator of man and the cosmos; just as the real need of man and the way of acquiring it cannot be known without divine guidance.

Religion is objectively actualized by the submission, faith, practice, and religiosity of human beings, while its essential reality is achieved by the sacred presence of God, by knowing Him, and also by knowing religion itself. Hence religion calls for an ontology, epistemology, and anthropology that is appropriate to it. Consequently, if any religious ontology and its other theoretical and practical concomitants are true, then religion and religious practice is also true and real. If this is not the case, then religion and religious practice is reduced to a mere notion and a practice that is based on that notion.

2. Do you see any conflict between your definitions of these two concepts?

According to the definitions of *science* and *religion* mentioned above: firstly, science is not limited to experimental science, rather it includes abstract intellectual sciences, as well as revelatory sciences which partake of tradition based upon revelation; secondly, *science*, when considered in all of its dimensions and levels, does not conflict with religion, and in fact some of the levels of science as such provide support for religious principles and foundations and allow for the possibility of religion and religious practice. For instance, the science pertaining to the sacred divine entity and its unicity, as well as the sciences of revelation, prophethood, and the afterlife, or of the supranatural aspects of existence, and other such sciences, inform the [theoretical] content of religion, [while its practical content is informed by the sciences that pertain to human] actions and conduct, both inner and outer, individual and social, in accordance with the ways and forms that God has legislated. In this way the totality of the laws and responsibilities pertaining to individuals or social systems come to be known. [After the doctrines and precepts,] the third category of sciences are those concerning the actual *subjects* pertaining to religious precepts and laws, whether these subjects are of the type that religious practice itself depends upon, or natural subjects, or constructed social subjects, or human subjects. Hence, all sciences, whether they use abstract or empirical means, or textual or deductive methods, and which apply themselves to the above-mentioned areas, are in fact interacting with religion, and even reality itself. This is why religion in its application and relevance to human life and the religious practice of human beings, given its various levels, is not feasible without the science that is appropriate for that level.

In addition to the fact that science on its various levels is the supporting principle of religious conduct and is prior to such conduct, it also serves as a criterion by which any possible deviations and errors on the path of religious conduct can come to be known. Religion distinguishes between true and false religion [and religiosity]. If religious conduct and submission to the divine will is not accompanied by science, it leads to misguidance. It is for this very same reason that Imam 'Alī (A) said,

> الْمُتَعَبِّدُ بِغَيْرِ عِلْمٍ كَحِمَارِ الطَّاحُونَةِ يَدُورُ وَ لَا يَبْرَحُ مِنْ مَكَانِه[1]
>
> The worshipper without knowledge (or science) is like the mill donkey who goes round and round but does not leave its place.

Religion is a path that man traverses over a lifespan by the means of his own acts and conduct, both inner and outer, while science is a lamp that designates and lights up this path. In other words, religion is the path, and science the lantern; what conflict could there possibly be between the path and the lantern? Again, religion is the method of human action and work which is expressed in the form of a body of laws, while science is the understanding of these laws, the principles needed for them, and their general and particular subjects; hence religion is known and understood by science.

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[1] Ghurar al-ḥikam wa durar al-kalim, p. 116.

From another perspective, religion puts forth clear mandates pertaining to that part of human activity that is related to the field of science. Hence religion introduces science and knowledge to be a human excellence and holds those who know to be higher than those who do not know. It states that the value of every human being is in accordance with his knowledge, just as the value of every science is in accordance with that which is known in it, and the need that man has for it to achieve felicity. Religion invites man to obtain beneficial sciences, and makes the learning and teaching of those sciences which are necessary for the fundamental felicity of man to be obligatory. On the other hand, religion considers those sciences, such as prying into the personal matters of others, which cause chaos and disrupt social relations, to be prohibited.

3. Where do you think there may be a conflict between these two?

According to the correct definition of science and religion that was previously expounded, logically no conflict could take place between science and religion. This is because the realm of science is the realm of knowledge and understanding of reality, while the realm of religion is the realm of faith and submission towards reality and practice based on the same. In the noble Qur'ān the veneration of God is said to be a consequence of the knowledge that a person has of Him.

إِنَّمَا يَخْشَى ٱللَّهَ مِنْ عِبَادِهِ ٱلْعُلَمَٰٓؤُا۟

> Only those of God's servants having knowledge truly fear Him. [Qur'ān 35:28]

In a tradition from Imam 'Alī (A) he says,

أَوَّلُ الدِّينِ مَعْرِفَتُهُ[1]

> The beginning of religion is the knowledge of Him [God].

But of course, faith, religiosity, and submitting to reality, and the conduct based on these, in its own turn, leads to new levels of the disclosure of reality. It is in this way that stages and levels of interaction and cooperation between science and religion come about, without there being any conflict between them. The conflict occurs when man does not submit to reality, and does not follow the light that manifests itself as science before him. In such a case, it is not so much a conflict between science and religion as it is a conflict between science and a belief-structure that has not been founded upon science and, in error, calls itself "religion". When an individual or a group is not bound to reality, they end up either distorting reality, or denying the principle of the authority of science and knowledge. Hence instead of putting their will in the service of science, they willfully oppose science, or even make science to be subservient to their own will, thereby denying the cognitive substance and enlightening quality of science.

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[1] Nahj al-balāghah, sermon 1.

4. What have been the grounds for the development of conflict between these two?

Just as it was stated in the answer to the third question, according to the definitions of *science* and *religion* that were put forth, there is no conflict or opposition between science and religion. The "conflict" that has historically been observed between these two is due to other factors, some of which are cognitive and others are non-cognitive or practical. The cognitive factors pertain to specific definitions of *science* and *religion*. Needless to say, these differing definitions are not due to linguistic factors, rather in many cases they are due to the particular epistemological and ontological positions of the person making the definitions.

A group of the definitions of *science* are such that they logically exclude religion and religious conduct. The definitions of *science* that lead to the denial of the scientific nature of religious knowledge belong to this group. One of these definitions is the definition that is based on a sensationalist, positivist, and empiricist approach to science. According to this definition, the types of knowledge that support the principles of religion or religious laws—namely, the intellectual, metaphysical, revelatory, and traditional sciences—are "unscientific" and are purely subjective, cultural, or intersubjective, and religion is also then purely a socio-cultural construct, or an existential tendency for which there is no clear scientific basis.

Some other definitions that have led to many historical conflicts are those definitions of religion in which *religion* and *religious texts* have been confused for one another. In such definitions, consideration is not given to the distinctions between religion, revelation, and tradition based upon revelation. Consequently, the conflicts that arose between tradition [i.e., textual authority] and empirical or abstractive rationality and reason were seen as conflicts between science and religion; while the fact is that there is a distinction between religion on one side and the intellect, tradition, revelation, and sensation on the other, just as there is a distinction between science and these matters. In reality, the intellect, revelation, intuition, and tradition based on revelation are sometimes the tools, and sometimes also the sources of [true] scientific knowledge, and science is a phenomenon that is acquired by these; while religion is a way of life and behaviour which is known by means of [true] science. In this estimation, revelation is the highest level of scientific knowledge, and it is infallible. Revelatory knowledge is made available to others by means of tradition and transmission, in the form of words and phrases. Human beings who are deprived of direct revelation, gain knowledge of religious principles and precepts by way of the intellect. In coming to know these subjects, the intellect uses abstract, empirical, and inferential means. Abstract methods are efficacious in matters pertaining to mathematics and metaphysics, empirical methods are relevant in those pertaining to physics, and inferential methods are used in those matters that are related to the understanding of religious texts.

It is possible that a person who uses the conceptual intellect [or discursive reason] with the above three methods to acquire knowledge will fall into fallacy or make a mistake. If he does not realize his mistake, he will be caught in compound ignorance; that is, he will consider what is not science as science. There are logical ways to verify and recognize errors. One of the criteria that reveals human error in the substantiation and knowledge of reality is the principle of non-contradiction. The appearance of a contradiction in any of the above methods signifies an error only on the level of substantiation [or formal proof] and in the understanding of the matter at hand, as contradiction in the context of actuality itself is impossible.

When two empirical or abstract rational arguments, or two traditional-textual arguments, are in conflict with one another, and if their conflict is not resolvable, it indicates the existence of a contradiction and the occurrence of an error. Just as there occur conflicts between two rational (and also empirical) arguments, or between two traditional-textual arguments, similarly they sometimes occur between rational (or empirical) arguments and traditional-textual arguments. In such cases when the distinction between religion and tradition or religious texts is not taken into account, and when religious texts, which include traditions that refer to revelation, are considered to be the same as religion, it is concluded that there is a "conflict" between science and religion. While in such cases the conflict is actually between traditional and rational arguments, or better yet, between two rational arguments, one of which pertains to empirical or abstract reasoning and the other to inferential reasoning which is responsible for interpreting texts. Just as there are ways and methods of resolving the conflicts that occur between two rational arguments, or two textual arguments, similarly there are specific ways and methods of resolving conflicts between rational and textual arguments.

If there is ever an initial discrepancy between a literal proof from religious texts and an experimental proof, definite principles can be employed in resolving it in consideration of the concomitants of each of them. This is because an initial discrepancy between science and religious texts is similar to the initial discrepancy between two empirical proofs or between two textual proofs; hence sometimes conclusive empirical knowledge is used as an intellectual proof to directly or indirectly qualify or expound a text, and sometimes a definitive traditional text is used as an authoritative and reliable proof to shed light on the essential context at hand in moving from the unknown to the known.

The other type of conflicts that occur between science and religion are those that are non-cognitive and do not pertain to how *science* or *religion* are understood [in theory], but rather, they are those that are considered to be *practical* conflicts. To explain, sometimes, the clear truth of divine revelation becomes apparent to people and they become aware of the truth of religion, but because religiosity and religious conduct is a free-willed affair, there is always a group of individuals who refuse to submit to the truth and instead of employing their will in the service of the truth that has become apparent to them, they take a selective approach towards it. They accept those parts of the truth that are compatible with their worldly desires and aspirations and they reject the other parts. Such persons are referred to in the Qur'an by the verse,

أَفَتُؤْمِنُونَ بِبَعْضِ ٱلْكِتَٰبِ وَتَكْفُرُونَ بِبَعْضٍ

> What! Do you believe in part of the Book and defy another part? [Qur'ān 2:85]

These types of distortions lead to "religious" delusions which are internally contradictory and have no cognitive or scientific validity. A "religion" that is produced in this way, when it is not able to protect itself from some of the fallacies at play, ends up negating [true] scientific knowledge and negating those sciences which are acquired by abstract and empirical rational means.

5. What has been the role of religion in the development of science in the West?

True religion is the guardian of science and truth, and such a religion follows the light of truth in its movement towards faith and belief. But religions that have been distorted are implicated in internal discord and contradictions, which are evidence of their erroneous nature. These types of religions inevitably place impediments in the way of intellectual endeavors and the sciences born from such endeavors, or ultimately, they end up denying the value and validity of the intellect and the abstract or even the empirical rational sciences.

Historically, in the Muslim world, the Qur'ān, which is a divine text and was revealed to guide and teach human beings, in addition to revelation, makes mention of the intellect, sensation, and also tradition as the means and tools of scientific knowledge, without restricting and limiting science to the realm of empirical knowledge only. However, along with the distortions that took place in the realm of tradition and religious conduct, there did also arise obstacles to intellectuality and the intellectual sciences. But these obstacles were not sufficient to entirely eliminate the path that the Qur'ān and the teachings of the Prophet (ṣ) and his progeny ('a) had created. In consequence, the Muslim world, with its broad and open approach to all the various levels of scientific knowledge, honored the scientific heritage of previous civilizations, and furthermore, by acquiring new sciences and knowledge, it became the link between the ancient sciences of former generations and posterity. Therefore, the religion of Islam has been effective in preserving the intellectual heritage of its predecessors, in invigorating and developing this heritage, and transferring it to the Western world after its development.

Christianity also, like other Abrahamic religions, by depicting the world as a phenomenon independent of man, rational, and orderly, and by considering man as a being who has the ability to know existents in this world, firstly, did not limit science to natural knowledge, and secondly, established the principles and foundations needed in the natural sciences. However, in what came to be officially accepted in regards the trinity during the First and Second Councils of Nicaea, Christendom failed to clarify the transcendence of God that the intellect gives evidence to, and became fixated on His immanence. This led to the conflict between abstract rational-intellectual arguments and the interpretation and understanding the church fathers had of scripture. The fixation upon and the authorization of the doctrine of the trinity effectively ended the access to abstract rationality and inferential rationality, leading to the sole authority of the text and the official interpretation that the Church had of it, and ultimately to the elimination of the intellect and the intellectual sciences. It was in this way that the baseless authority and power of the Church led to those intellectual sciences that gave conclusions contrary to the official interpretation of the Church to lose their validity.

With the eventual decline of the power of the Church no efforts were made to repair the relationship between the intellectual sciences and the traditional sciences, rather, in keeping with the aforementioned opposition, the authority and the validity of the traditional sciences was now also denied. While, in the philosophy of Descartes, "scientific" enlightenment was limited to rational and conceptual sciences. Now, as the validity and authority of tradition is dependent on the validity and authority of revelation, by having denied the former, the latter, along with intellectual and other higher forms of intuition were also denied. The elimination of revelation, intuition, and tradition, and the subsequent confinement of the intuition of reality to sensory intuition, something that took place at the hands of Kant, led to universal rational concepts becoming purely subjective concepts, which could only be proved or disproved by the senses. It was in this way that scientific knowledge came to be limited to empirically verifiable knowledge and thereafter metaphysical and value-laden propositions were no longer considered as knowledge that is "scientific". While this interpretation of "science" does not explicitly deny the transcendent and sacred realms of existence, it effectively impedes the acquisition of knowledge with regards to them, and leads to a type of fideism that does not have any substantial intellectual and scientific content.

In the history of Western thought and philosophy, the denial of the enlightening quality of the intellect in relation to existential realities not only deprived religion of scientific backing [and cognitive content], but it also invalidated the non-empirical fundamental propositions and the metaphysical principles of the experimental sciences themselves. This denial paved the way towards historical, cultural, idealistic, or instrumental and purely pragmatic interpretations of "science". While religion, *per se*, does not block the path of science and, in fact, brings with it an ontology and epistemology that provides the foundations of experimental science, distorted versions of "religion" and the selective approaches taken by them during different historical periods have been the source of conflicts and issues. These issues have not only deprived religion of its truly scientific foundations, but have also damaged the truth-seeking and enlightening quality of science itself.

6. Can we have a religious science?

The qualification of *science* with the adjective *religious*, due to its subject, metaphysics, method, and other aspects, is not only possible, but rather it is necessary.

If the subject of a science is religion *or* anything which founds the basis of religion, that is to say God, His attributes, His signs and words, or His creation, then that science is in reality and truly *religious*. In this case, that which facilitates the true attribution of *religious* to science or any field of knowledge is the principle of the unity of knowledge, the known, and the knower, which has been proven in the transcendental philosophy of Mulla Sadra.

It was previously stated that religion is mandated by the divine legislative will, that is, religion is based on the will of God; and God is absolute and infinite, and by virtue of the infinity of His absolute existence, all other existents, including those in the natural world, are nothing but His signs, symbols, and creations. If reality is approached in this manner, then the modern concept of "nature", which, under the influence of the Encyclopaedists, came to be the subject of the natural sciences, would be transformed and would return to its true meaning where it would be seen as the *creation of God*. The result would be that the natural sciences would have a fundamental role to play in the knowledge of God's creation and that they, with the help of an empirical knowledge that is founded upon intellectual and theological principles, would discover the wisdom and order of God's acts. Consequently, [from the perspective of theory,] these sciences would be qualified as *religious*, and [from the perspective of practice,] the interaction that man has with nature would stop being one of violation, and instead, man as the viceregent of God would take on his religious responsibility of making the earth to flourish and having sympathy for it, as per the verse:

هُوَ أَنشَأَكُم مِّنَ ٱلْأَرْضِ وَٱسْتَعْمَرَكُمْ فِيهَا

> He brought you forth from the earth and made you to seek its cultivation/flourishing. [Qur'ān 11:61]

If the reality of the entire world is its being the signs of God, and if [the function of] science or knowledge, in all of its multiple levels, is to reveal the reality of the known, then true science is nothing but religious science—any other way of looking at the world is the result of unfounded human delusions and imaginations and does nothing but veil reality from the observer. In this estimation, science can be nothing other than *religious* and hence a "non-religious" science is an impossibility.

If the research of a scientific researcher leads to actuality, and the reality of an existent, which is an act and sign of God, becomes known to him, then that empirical knowledge is a *science* that is *religious*; moreover, this researcher is the knower of a religious matter and will be granted the special rewards associated with the same. But if it does not lead him to actuality, and the reality of that existent and divine sign remains unknown to him, because no knowledge was acquired, nothing can be said of its being religious or not; in such a case, due to the sincere efforts put in the path of this research, the researcher will be recompensated accordingly.

Any *science*, whether empirical or non-empirical, is a systematically organized body of knowledge (or issues and propositions) that has a common subject, a given purpose, and a particular method. The subject matter is itself effectual in the delineation of the purpose and method of such a science, and the issues of a science are also ultimately contingent upon this essential element which is its subject. This is because the predicate of a scientific issue or proposition is a particular quality or effect amongst the qualities and effects of its subject, and the relationship [or copula] between the subject and the predicate is consequent upon both of them. Hence, the principal criterion of all aspects of a science is its very subject. The subjects of all empirical, mathematical, philosophical, and mystical sciences, which pertain to the objective realities and truths of the existential order, are known by means of the senses and the intellect, or the "ear" and the "heart", and are all "employed so that you can earn a livelihood and not be negligent [of its Source]". All of these are the *acts of God*, as, according to what has been recorded in all religious scriptures, in particular the Qurʾān, each and every existent, irrespective of its space and time, and regardless of whether it is a mineral, plant, animal, human, or angel, in the heavens or on the earth, or whether it has been discovered or remains undiscovered, is an effect, creation, word, and sign of God. Hence, in the same way that all of the holy scriptures and texts that were revealed to the prophets of God are the *words of God* and meditation and speculation upon them is *religious*, similarly, discussion and speculation upon the *acts of God* is also *religious*. Every science, in particular empirical science which is the science under question here, has its own method, sources, principles, and axiomatic principles which it uses to go from the unknown to the known; such theorizing and speculation [that takes place] in the empirical sciences is definitely *religious*, even though the acceptance or the denial of this is a free choice given to the scientist or scholar, whether he be a monotheist believer or a secular person. Regardless of this choice, [objectively] empirical science is definitively divine and religious, in the same way that faith and the acceptance of God, revelation, the afterlife, and all the other matters that man takes as doctrine, are divine and religious. It must not be forgotten that being *religious* includes both *intentional* (mandated) and *provisional* (preparatory) acts. Some acts are not valid if they are not accompanied with the intention of proximity [to God], such as ritual prayers and fasting, while others are correct even without this intention, such as paying employees or the repayment of loans. The *religious* nature of empirical science is of the latter type of affairs, ones that are considered provisional in the divine school of thought. The humanization of religious science, in the meaning that it is a human being who is obtaining and coming to know this science, does not detract from its *religious* quality, just as the humanization of faith and belief, in the meaning that it is a human being that has faith or comes to believe, in no way harms its *religious* nature.

The noble Qur'ān, like other sacred scriptures, considers all that is in the cosmos to be a sign of God. God says:

إِنَّ فِي ٱخۡتِلَٰفِ ٱلَّيۡلِ وَٱلنَّهَارِ وَمَا خَلَقَ ٱللَّهُ فِي ٱلسَّمَٰوَٰتِ وَٱلۡأَرۡضِ لَأٓيَٰتٖ لِّقَوۡمٖ يَتَّقُونَ

> Indeed, in the alternation of night and day, and whatever God has created in the heavens and the earth, there are surely signs for a people who are God wary. [Qur'ān 10:6]

Then He invites man to speculate upon the order that is imbued within creation, which is a divine act and sign by saying:

فَلۡيَنظُرِ ٱلۡإِنسَٰنُ مِمَّ خُلِقَ

> So let man consider from what he was created. [Qur'ān 86:5]

أَفَلَمۡ يَنظُرُوٓاْ إِلَى ٱلسَّمَآءِ فَوۡقَهُمۡ كَيۡفَ بَنَيۡنَٰهَا وَزَيَّنَّٰهَا وَمَا لَهَا مِن فُرُوجٖ

> Have they not then observed the sky above them, how We have built it and adorned it, and that there are no cracks in it? [Qur'ān 50:6]

أَفَلَا يَنظُرُونَ إِلَى ٱلْإِبِلِ كَيْفَ خُلِقَتْ وَإِلَى ٱلسَّمَآءِ كَيْفَ رُفِعَتْ وَإِلَى ٱلْجِبَالِ كَيْفَ نُصِبَتْ وَإِلَى ٱلْأَرْضِ كَيْفَ سُطِحَتْ

> Do they not observe the camel, [to see] how she has been created? And the sky, how it has been raised? And the mountains, how they have been set? And the earth, how it has been surfaced? [Qur'ān 88:17-20]

Hence the theorizing and speculating in coming to know the signs of God, especially when it is in accordance with the divine text and the revealed commands, is definitely *religious*, and calling it "divine" or "religious" is superfluous.

A great part of the teachings of the Qur'ān guide man towards his intellectual nature. The response of theorists to these teachings is not the same and uniform. Some of them take the secular approach and, turning away from these teachings, and expound natural phenomena purely under this-worldly and non-theistic "principles". The bitter consequence of such an approach, are theories which distort reality and lack sound intellectual and divine foundations. Monotheists on the other hand, by accepting the teachings of the Qur'ān, make use of intellectual metaphysical principles, and the sweet fruits of such an approach is the monotheistic [and integrally unitive] exposition of the created order.

The experimental sciences can also be considered as *religious* due to their metaphysical bases and inner structure. This is because, as was previously mentioned, the sensorial and experimental sciences, contrary to the conjectures of positivists, cannot even take shape without first having taken a stand on certain metaphysical principles. For instance, with regards to such "principles" as denying the existence of a reality that is independent of man and holding it to be a human construct, or restricting reality to purely the material (upon which modern science is either based on or inclines towards), it can be said that none of these "principles" is sensorial or empirical and that, rather, they are propositions that can be classed as *metaphysical* and which affect the structure and the nature of experimental sciences. Religion, for its part, calls for a realist metaphysics that is based on the unicity of God, and there is no doubt that this metaphysics has its own particular consequences and effects on the experimental sciences.

Experimental sciences are also qualified as *religious* according to their methods and results. This is because religion is accompanied by its own special epistemology. Just as religion does not limit existence to the terrestrial realm, similarly it does not restrict the means of cognition to the physical senses and imagination. Rather, it holds that intellection, revelation, and tradition based on revelation are also means of cognition and scientific knowledge. This position prevents science from being limited and restricted to the experimental sciences and allows for systematic and efficacious interactions between the rational experimental, abstract, and inferential (used in religious texts) methods.

Science or knowledge is also characterized as *religious* according to its logical harmony with the religious life of the scientist or knower, as well as with the cultural and civilizational identity of societies. For, as was previously stated, a personal belief in the divine, or a living religious culture, is accompanied with its own appropriate ontology, metaphysics, and epistemology; and a consequence of this set [of philosophical bases] is that it gives rise to a science that is compatible with it.

7. Can science dispense with religion?

If what is meant by *science* is "experimental science", then science cannot ignore or be silent with regards to religion from three aspects: First, principles and structure; second, utility; and third, subject.

The first aspect pertains to the founding principles and internal structure of science: Contrary to what was espoused by the Vienna circle, science, in its cognitive structure, is not independent of metaphysical propositions, such as the principle of the existence of a reality independent of man, or the principle of causality and the knowability of reality. One of the positions from which the experimental sciences cannot suspend judgement pertains to whether the interpretation of the natural world is based on the presence of an absolute Divine being or whether it is independent of it. The former position leads to scientific knowledge being religious and Divinely, while the latter results in it being secular and worldly. The denial of the transcendent and immaterial dimensions of the world and man, as was mentioned in the answers to the previous questions, logically leads to the destruction of the enlightening and truth-seeking quality of science, and reduces [the existing] experimental sciences to the level of a set of tools for living an individuated [biological] life.

The second aspect pertains to the fact that from the perspective of *utility* the experimental sciences cannot ignore religion: Users always employ the experimental sciences in a way that suits their own values and they propagate the same through education. While it is true that the natural sciences do not discuss metaphysics and value-laden issues, nevertheless they give rise to values that are within the limits of the values of their users and which take shape according to the mental and social environment of these users. Now, because religion is value-laden, the users of the natural sciences have no choice but to take a stand on religious values—they either accept those values and employ the natural sciences accordingly, or they use values that are non-religious and illusory.

The third aspect pertains to the fact that from the perspective of *subject* the experimental sciences cannot ignore religion, and in fact make religion the subject of their study, as it is clearly present and expressed in the individual and social actions of human beings, producing thereby sciences such as the sociology of religion, the psychology of religion, and their like. If the experimental sciences have non-religious bases and structures, they interpret religious phenomena in secular and worldly terms. These types of "scientific" interpretations, by denying or eliminating the sacred and monotheistic dimensions of religion, effectively impede a way of life that is marked by faith in God. On the other hand, if the experimental sciences have religious bases and structures, they have sympathetic interpretations of religion. If the experimental sciences have, as was previously explained, a proper metaphysics and a religious structure, then in all cases their subject of study is qualified as *religious*, because in such cases the universe is seen to be the scene of God's wisdom and creation, and natural existents are studied as divine creations.

8. Can one separate the domains of activity of science and religion completely?

From what has been said in the answers to the previous questions, it is understood that although the *concepts* of science and religion are different, their *instances* are inseparable from each other. Religion is based on and requires a special kind of ontology, that is, it is based on a sacred, spiritual, and monotheistic view of the world, and this view logically affects the nature of the subjects of various sciences, including the natural sciences, and also their metaphysics, epistemology, and methodology. The existence or non-existence of an absolute and infinite being are in fact contradictories, and hence the experimental and natural sciences cannot be indifferent to this critical matter because of the necessity of exactly establishing their subject of study and their metaphysical foundations. If science is based on a monotheistic ontology, it will be religious; but if it takes shape by rejecting such an ontology, then it will be secular. Secular knowledge, based on what has been mentioned in the previous answers, inherently cannot defend its enlightening and truth-seeking credentials, and will ultimately have to relinquish its claims to be seeking the "truth" due to the [reductive nature of its] positivistic interpretation of science, and in so doing, it will default towards a purely postmodern and instrumental interpretation of "science".

Because the existence or non-existence of a divine being are contradictories, in objective reality one of these two exists and the other is non-existence. Similarly, with regards to the two types of science, religious and secular, or in other words, two types of interpretations with regards to the world, one is true and the other is false. Experimental science is inherently incapable of addressing this issue. A full understanding and an important judgement in this regard is the responsibility of metaphysics.

In the same way that science with its inherently religious nature, allows for the possibility of faith, belief, and the religious life, it also makes possible the distinction between true religion and false religion, or no-religion. Secular science, with its non-religious interpretations and understandings of man and the world, blocks access to the religious way of life.

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1. What is your definition of science and of religion?

There is almost a universal consensus about defining science as a systematic study of natural phenomena and religion as guidance to belief in God and moral action. This is borne out by the definitions of other respondents included in this volume. Therefore, I will not attempt to give a new definition of these two terms. Regardless of one's specific definition of religion and science, the problem arises when it comes to deciding what to do with these definitions, and how to relate them to one another.

Within a theistic context, the source of religion is Divine whereas science is a human enterprise. This seems to be a safe way of delimiting the domains of religion and science. In this view, it would be possible to separate the domains of religion and science without much difficulty. This would presumably pre-empt any conflict between the two. As a matter of fact, it would also prevent us from speaking of any harmony or even relation between religion and science as they are defined as two radically different enterprises, one Divine, the other human. One can go even further and make similar distinctions between science, art, ethics, philosophy, and other fields of knowledge.

The matter, however, is more complicated than such a theory of radical independence may suggest. There is a persistent element of what we might call the hermeneutic principle in all things in which the humans are involved. This principle applies to both religion and science. It is true that authentic religions are of Divine origin. In this broad sense, religions are not human creations. But religions are sent for and lived by human beings. The universal message of religion takes on different forms and colors at the hearts and hands of its followers. In this narrow sense, there is something "human" about the way this universal message is understood and translated by different human beings. The rich diversity of religious traditions both within themselves and across the board is a testimony to this hermeneutic principle.

When we turn to science, we are faced with a different set of assumptions. Science *is* a human enterprise. But it claims to be a very special one among others, and seeks to have privileges others do not posses. It purports to be an ontologically true and epistemologically reliable picture of the natural world, leaving very little room for arbitrary and/or subjective forms of knowledge. The 19th century positivists used these arguments to divinize science, and assumed falsely that natural sciences investigate the physical world without presuppositions. This was an attempt to look at the world from "a view from nowhere", to use Thomas Nagel's phrase. Just like the mystic who is in this world but not of it, the pure scientist wanted to see the world from a God-like point of view without himself being in it.

In discussions of science both in the West and other parts of the world, we have come a long way to see the fallacy of such a view of science. It is now commonly accepted that science is one among other human endeavors to make sense of the world in which we find ourselves. While serious studies on the history of science from E. A. Burtt to T. Kuhn and others have been seeking to humanize science, such critiques of modern science as R. Guenon and S. H. Nasr have been trying to put it in its rightful place of being a way of understanding physical reality.

2. Do you see any conflict between your definitions of these two concepts?

In view of the above points, it is not difficult to see a hermeneutic principle at work in both science and religion. Therefore, it is through this hermeneutic principle or set of principles that we can relate the two. Whether we create a relationship of conflict or harmony between religion and science will depend largely on our particular point of view, and reflect what kind of a moral order we would like live by. In this sense, there is no intrinsic conflict or harmony between religion and science.

3. Where do you think there may be a conflict between these two?

I think a conflict arises between religion and science when we violate the principle of hermeneutics, and loose sight of the big picture of which we are a part. Historically, the most notorious cases of religion-science conflict have come about not because a scientist's "pure facts" have contradicted a religious belief. Rather, they have come about when different and often competing sets of philosophical and metaphysical principles have been pitted against one another. Equally important is the fact that when we talk about a conflict or "warfare" between religion and science, we are talking about a specific history, i.e., the history of Western civilization since the 16th century. We don't find such drastic cases of disharmony between religion and science in other cultures. For instance, in the Islamic world where you had a well-established tradition of high scientific culture in harmony with the Islamic view of the universe, what we have is a series of "adjustments" rather than outright conflict between the demands of religious faith and findings of science. In this sense, the question of whether or why there is a conflict between religion and science should be specified as why such a sharp conflict between the two has arisen in the West.

Having said that, we have to be careful not to make artificial absolutes out of such cases of conflict. Neither the history of religious thought nor natural science have been a smooth process of moving from one argument to another, culminating in a spotless edifice of religious beliefs and scientific truths. There is as much controversy in the history of science as in the history of religious ideas. A healthy dose tension is always needed.

4.What have been the grounds for the development of conflict between these two?

If we look at the history of modern science since the 17th century, we see that the most important points of tension between the new scientific culture and the traditional Christian worldview have been caused by the disparity between alternative philosophical assumptions rather than between scientific facts and religious beliefs. Even in the famous Galileo trial, what was at stake was as much medieval Christian cosmology as traditional Aristotelian physics which had then become a cornerstone of scholastic philosophy. The new scientific data made possible by such scientists as Copernicus, Galileo, Kepler or even Newton were not directly responsible for the kind of schism that came about between the religious view of the universe and the new secular science and scientism in the 18th and 19th centuries. In this regard, I believe that scientific data can be used for or against any particular worldview, whether religious, secular or agnostic.

It is also important to point out the narrative of conflict that is being taken for granted today was not necessarily the most dominant aspect of the history of religious and scientific ideas in the 16th or 17th centuries. Rather, it is a result of reading the conflict narrative of the 19th century historiography back into that history. We have to remember that Copernicus or Kepler is not the August Comte or Richard Dawkins of their time. Even Galileo cannot be considered a vanguard of scientific fact against religious dogma in the sense that we understand these terms today. It is very difficult for us today to read the history of 16th and 17th century science without invoking almost unconsciously the images of the Enlightenment dogmatism of science, its concept of the knowing subject as the master of the universe, and its obvious distaste for religion. Add to this the images of Darwin and his second-rate secularist followers in Europe and elsewhere, we end up with a picture of science that is intractably enmeshed in a perpetual conflict with religion. In Short, it is important to state, at least historically, the specificity of this conflict within the history of modern West.

5. What has been the role of religion in the development of science in the West?

Christianity did play an important role in the development of a scientific culture in the West as it did in the case of arts, philosophy, and other fields of knowledge. There is no such command as "you shall study the universe and be a scientist" in Christian sources. In fact, the same can be said of other traditions even though Muslims would take exception to themselves by quoting the famous saying of the Prophet of Islam which encourages Muslims to "seek knowledge even if it is in China". But even in the case of Islam where there is so much emphasis on looking at the signs of God (*ayat Allah*) in the universe, it would be a mistake to translate "knowledge" *(ilm)* as science in the modern sense of the term. Yet, religions, including Christianity, do provide some broad guidelines about the nature of the universe that the natural sciences study. The idea of the intelligibility and order of the world, and the possibility to know it rationally, can easily be interpreted as religious ideas at the same time. Like other a priori concepts of science, such ideas about the universe provide a context of justification for scientific investigation.

6. Can we have a religious science?

I think it is a misnomer to speak of a "religious science". We can talk about a religious view of the universe and even a religious philosophy of science. There is a useful distinction made by some contemporary philosophers of science, which we can invoke here. The distinction is between context of discovery and context of justification. The context of discovery refers to the kind of actual scientific work that a scientist does in his/her specific field of investigation. It also provides a framework within which scientific data can be defined a universal and transferable. It warrants us the possibility to refer to scientific data as the same under the same or similar conditions of experimentation. At this level of "hard science", the philosophical and religious presuppositions of the scientist play a limited role but are not totally absent from any given scientific activity. The context of justification does have an impact on the way the context of discovery is shaped. The reason why a scientist chooses to investigate a particular field of research rather than other is ultimately a philosophical decision.

The context of justification refers to the second-order conceptualization of available scientific data. It is the context within which we draw certain conclusions from the so-called hard facts of science. This is where science becomes a hermeneutic enterprise in the full sense of the term, and cannot escape the questions of philosophy, religion, and ethics. It is at the level of justification that we can talk about science as religious or secular. In other words, the context of justification, which is an integral part of all scientific traditions, allows us to speak of a particular philosophy of science that can be religious or secular. In this sense, we can have Islamic science if we mean by it an Islamic philosophy of science in which the context of justification shares the essential tenets of the Islamic view of the physical world. Confusing the contexts of discovery and justification may lead us to a misguided understanding of both science and its relationship to religion.

7. Can science dispense with religion?

In light of what I said above, science can dispense with a particular religion such as Islam or Christianity but cannot claim to be operating within a framework of "no presuppositions". Some people both within and outside the scientific community have already dispensed with religion. The question is not whether science can dispense with religion because it can and has done in the West but rather whether it should, and if it does, at what cost. I think the wild adventure of modern science since the last century, its never-ending exploitation by profit-driven economies of our time, and its devastating impact on the natural and human habitats give us enough reason to re-evaluate the limits of scientific enterprise as it is practiced in the world today.

8. Can one separate the domains of activity of science and religion completely?

Since we defined science as a systematic study of the world of nature within a particular view of the universe, it is not easy to argue for a complete separation between religion and science. There are points of convergence and divergence. The conflict arises when science is defined as an alternative ideology that makes claims beyond its limited field of research. The natural sciences by definition deal with the physical world, and their jurisdiction is limited to this level of reality. Unless we reduce reality to what we can sense through our five senses, sciences cannot make any large claim about the philosophical and religious significance of the universe. As long as we keep a scientific explanation as a scientific explanation and nothing more, we can secure a relationship of harmony between the two ways of looking at reality. To give an example, a writing on a piece of paper that says "2+2=4" can be read in two different ways. From a chemical point of view, the shape that we call "2" is just a string of dots on a flat surface. Their chemical components are not different from the shape that we call "4". This "scientific" reading of the numbers 2 and 4 are justified and correct. But we can also read these signs as *saying something*, I.e., expressing a mathematical idea. At this level of reading, "2" is not just a shape composed of a string of dots on a flat surface but a *number*. A highly specialized scientific explanation furnishes us with the chemical or physical nature of number 2 on a piece of paper. But it cannot give us the concept of number.

In short, we can read the same reality in two (and presumably more) different ways without necessarily conflicting claims of truth. This will depend largely on defining science as a highly specialized yet limited form of knowledge. In light of the above considerations, the domains of religion and science cannot be easily separated. If we mean by science a way of understanding the physical nature of the universe, and by religion not rituals but a worldview by which we look at the world, then there are more points of convergence than divergence between religion and science.

Prof Mohammad Hashim Kamali

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Postgraduate Experience: Currently, he is the Founding CEO of the International Institute of Advanced Islamic Studies, Malaysia and a world renowned scholar in Islamic law and jurisprudence. He was Professor at the International Islamic University Malaysia (1985-2004), and then Dean of the International Institute of Islamic Thought and Civilization (ISTAC) 2004-2006. He is Senior Fellow at the following four institutions: IAIS Malaysia; Institute of Strategic and International Studies (ISIS) Malaysia; Academy of Sciences of Afghanistan, and the Royal Academy of Jordan. He is on the International Advisory Board of thirteen academic journals published in Malaysia, USA, UK, Canada, Kuwait, India, Australia and Pakistan. He has served as a member and sometime Chairman of the Constitution Review Commission of Afghanistan (2003); as a UN consultant on constitutional reforms in Afghanistan, the Maldives, Somalia and Iraq.

Dr. Kamali was Assistant Professor at the Institute of Islamic Studies, McGill University in Montreal (1979–84); and Research Associate with the Canada Council for Social Science and Humanities (1984–1985). He has been a Visiting Professor at Capital University, Ohio (1991), as well as Visiting Professor at the Institute for Advanced Study in Berlin, Germany (2000–2001).

Publications: He is the sole author of 45 books, and co-author or editor of 15 books. He has published over 260 academic articles. Many of his works are reference books in reputable universities worldwide. His works have also been translated in 13 languages.

1. What is your definition of science and religion?

Science may be said to have two meanings, one of which refers to a cumulative body of knowledge, as opposed to isolated pieces of information that fall short of reaching the status of knowledge and this may be on any subject, scientific or otherwise. The other meaning of science that is of interest to us here characterises a particular field of knowledge designated as science, or scientific knowledge, in contra-distinction, for instance, to history, anthropology and theology etc. Science as such is a discipline of thinking predicated on the use of objective and universal reason to describe and explain all that there is. Science refers primarily to knowledge of physical reality that is provable by tangible evidence thus precluding metaphysical reality and religious beliefs. Science also deals with and explains how matter came into existence, how life arose, and in what manner human beings arrived on the earth. It is concerned with the whole of existential reality, life, earth, the universe and so forth.

Religion is primarily marked by belief in God, revelation, soul and spirituality and aims at meanings, values and truth. Religion constructs and presents a set of moral values that ideally nurture a holistic meaning of both the internal and external dimensions of truth, worship, self-discipline, fair treatment of others, and a just character. Belief in God also entails belief in His creative powers and attributes as well as appreciation of His creation.

2. Do you see any conflict between your definition of these two concepts?

Basically no, for I have visualised science as knowledge of God's created universe and nature, and as such, science becomes an extension of that inclusivity expressed in my conception of the religion. Both religion and science look at the two different aspects of reality. Since their subject matter and outlooks also differ, there should be no inherent conflict. Conflict would arise if both looked at the same subject matter at the same time. In the case of Islam, Qur'an being God's revealed speech is seen in two lights, one as the Qur'an tadwini, the text as one reads, and the other as Qur'an takwini, a reading of God's existential creation. This is more than a symbolic description since a great deal of the Qur'an refers to the mysteries of creation, the natural world, planets, seas and mountains. By its own affirmation, Qur'an is a Book of signs (ayat, lit. signs) seen in the outer horizons and within the self, or inner horizon, of its readers (cf. Fussilat, 41:53). This reading of the religion opens a vista on science, which is knowledge obtained from the observation of those signs.

Islam is also a unitarian (tawhidi) religion such that it seeks to integrate the many different aspects of reality within the overarching vision of tawhid, hence also its view of religion and science. Muslim scholars of the so-called Golden Era of Science (c. 850-1250 CE) were ahead of their western counterparts in science partly for reasons that the Qur'an strongly advocated truth discovery and study of observable reality. Religion in this case supported science and spoke of spiritual rewards for knowledge discovery in the spheres both of religion and all other beneficial knowledge. Islam as such cannot be said to have advocated the denial of science. Yet a dry reading of science in its western conception of the so-called Enlightenment philosophy sought to confine science to knowledge of physical reality thus denying recognition of all things metaphysical, which is tantamount to the denial of religion and its exclusion from the purview of science.

3. Where do you think that there may have been a conflict between the two?

An answer to this question has been given under question 2 above. Additionally, when science denies metaphysical reality and when it is asserted that science can answer all questions and is in no need of religion, that is where conflict can arise. The fact is that science was never able to answer all questions about man and nature, the planet earth and the wider universe beyond. Science is man-made whereas religion originates in God and revelation. For a scientist to claim that nature and universe with their unfathomable complexity, punctuality and order all came through a series of accidents, big bang and black hole etc., has not inspired conviction.

4. What have been the grounds for the development of conflict between these two?

Misunderstanding perhaps on the part of scientists and men of religion to open the horizons of their understanding respectively of religion and science, and look into the vistas of integration between them. Exceptions apart, the majority of scientists and religious thinkers of the modern era have looked away from one another. Instead of trying to see each other's viewpoints, as was the case to some extent, prior to the era of scientism and 'science revolution,' but have since then acted as rivals and engaged themselves in competing claims.

History is yet another factor of differentiation. The long-standing power play between church and state in the medieval West served to widen the gap between religion and science. The tussle continued into the twentieth century when in the two World Wars the tools of science, aeroplanes, fire power and armoury of all descriptions were used to destroy humanity and civilisation, showing clearly that science cannot bring peace to the world. Since the strident emergence of scientism in the second half of nineteenth century, science increasingly became the religion of the scientist and the gap between religion and science grew wider ever since, notwithstanding the relative softening of those attitudes by some scientists in late twentieth century and since. The early history of religion is also reminiscent of the stark and hostile denials of science by politicians and men of religion in the renowned episodes of Gallileo, Darwin and Huxley-Wilberforce. In the Islamic context, due to the unitarian (tawhidi) outlook of Islam over all branches of knowledge, and the venerated history of the so-called Golden Era of Islamic science, Islam has not taken a confrontational stance with science. Yet it is also true that Islam's historical precedent has hardly been continued and that Muslim contribution to modern science has been negligible on the whole.

5. What has been the role of religion in the development of science in the West?

The answer to this question is most likely a mixed one. To the extent that religion has encouraged intellectual enquiry and investigation of the world and observable reality, as in the case of Islam and basically most other great religions, religion may be said to have played a proactive role in the development of science. Most classical theological theories about the creation by God stimulated scientific questions and debates. Science in Europe basically emerged in a theological worldview. Also many religious scholars discussed natural philosophy that was in many ways the precursor of modern science. Religion has also, to the extent possible, informed science with moral vision and values. Some traditional religious practices have also been scientifically proven to be beneficial as in the case of male circumcision in Judaism, Islam and some branches of Christianity, and of meditation in the case of Buddhism. In the event, however, when the conclusions of science went against religious dogma and doctrine, as in the case of Darwinism, instances of conflict were noted, in which case, as may be expected, religion ceased to play a proactive role in the development of science.

6. Can we have a religious science?

If by 'religious science' is meant science that is compliant with religious beliefs and doctrines, then this is what Islamic science has meant as in the articulations of the Golden Era of science in Islamic history. It is a case basically of a theo-centric science in rather a symbolic sense. For religion would not seek to interfere in the process of scientific investigation or of its results, provided that there is no denial of religious dogma and beliefs. When there is integration of religion and science, the result could be said to be a 'religious science.'

But if 'religious science' is meant in the sense of systematic/scientific investigation and construction of a body of knowledge, this is also possible, as in the usage 'religious sciences' ('ulum al-din) or 'hadith sciences' ('ulum al-hadith) etc. What is meant here is a cumulative and systematic organisation of the data of religion (and that of the hadith) into a body of knowledge.

7. Can science dispense with religion?

The answer has to be yes, if one looks at science in its Western context and that of the Enlightenment Philosophy that took its substance in the notion basically of dispensing with religion. This view of science has, by its own affirmation, dispensed with religion, and it is also the dominant scenario in so far as Western science has become triumphant and self-acclaiming. The question may also be raised, however, whether one can have a purposeless science that has no sense of value and purpose. If this is to be acceded, then there will theoretically be no objection to robots that effortlessly commit crimes, maiming and killing innocent humans, and no objection also to cloned children that are selected to be genius, or perhaps ruthless criminals, without any awareness of ethics and humanitarian values. Western science has not gone that far, notwithstanding its overt denial of religion. One may even say that it has not in reality dispensed completely with the sense of value and purpose, which are important parts of almost all great religions and civilisations. What this also means perhaps is that science cannot dispense with religion. The reason may also be that many scientists are also practicing men of religion, and human activities do not come from separate realms. Both religion and science are human activities.

8. Can one separate the domains of activity of science and religion completely?

Essentially no, for religion is also concerned with nature and universe that constitute the main constituency and subject matter of science. Religion and science are, as already said, both human activities. Hence the study of science also relates to religious questions and vice versa. The Qur'an, for example, speaks of the precise order, punctuality and manner the sun and moon navigate the outer space, regulate and affect the earth – scientific themes placed in a religious context. But functionally perhaps yes, as the two domains of activity are separate. Yet if by 'completely' is meant the two domains can be separated both essentially and formally then complete separation is not feasible, because:

- Religion can provide a sense of direction and purpose to scientific enquiry. For science observes, discovers and explains but is unable to determine value and purpose.
- Scientific evidence shows that the harmful effects of industrial pollution have reached alarmingly dangerous levels that threaten dire consequences for humans and other life forms on a global scale. The ever-increasing production of fossil fuels, carbon emissions and other pollutants have endangered human happiness and health, especially of the poor communities and economies that are ill-equipped to defend themselves against them. Industrial pollutants that poison water supplies and the food chains violate one of the highest maqasid (aims) of religion, namely the protection of life. Religion does not permit harmful applications of science.
- After the so-called Renaissance, of 17th-18th century Europe, a starkly secularist epistemology of science was advanced that excluded religion and metaphysical truth from the scientific purview of reality. The relationship of science to religion was effectively severed, and science became a religion unto its own. The view thus prevailed that science has no need for religion and even sees religion as an obstacle in its way. Theistic religions' holistic vision of a merger between scientific activity and ethics can make a significant contribution to the creation of a revised epistemology of technology and science.

Prof. Vladimir Katasonov

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Education: Moscow State University, Mathematical Department (1971); St. Tikhon's Theological Institute (1997); D. Sc in History of Philosophy (1986) D.Sc. in Philosophy of Science (1995); D. Sc. in Theology (2012)

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Awards: 1995 John Templeton Foundation Science & Religion Course Award.

1. What is your definition of science and of religion?

Science – objective knowledge of reality. This presupposes the subject–object division in reality, as result of which a subject cognizes an object.

Religion – the intercourse of man and God.

2. Do you see any conflict between your definitions of these two concepts?

The subject-object division defines: 1. The special kind of scientist's point of view on reality: to see in the light of general objectivity, excluding all subjective elements (personal feelings, evaluations, etc.); 2. The special sort of scientific language and the special kind of communication in science: scientific knowledge is compulsory and all–meaningful one. The natural sciences lead to the discovery of the so-called *laws of nature*, which are, generally speaking, *a-historical, independent of time*. One invents the special kind of experience –*experiment* – through which one can be convinced, always and everywhere, in the truth of these laws.

At the same time, there are the domains of life where the objective knowledge can't be the authentic expression of the experience. The examples are: the art, the intercourse with other persons, the intercourse with God. Already, in knowledge of other persons I can't express the essence of my understanding in objective terms: my understanding of men depends on my personal attitude towards them; the whole scale, from the knowledge of hate to knowledge of love is possible (and the last is the most profound). In the intercourse with God I have the experience, which, especially, is not expressible, in its kernel, in objective terms. I meet in God something, which turns to be my most profound essence. The revelation of God to me is, at the same time, the most profound my self-revelation. I can't divide here the object of cognition and its subject. I have to comprehend the encompassing. It demands of me a special kind of activity. It isn't the activity of some special human capacity. It's the case, where I act, as a whole. We can designate this kind of integral capacity by some name - *the heart, the person, the self*, etc. – but, at the end, the main point is, that it can't be algorithmized. It can't be reduced to the pure logical activity of mind.

The intercourse of man and God has essentially a *historical character*. It is the history of vows and promises, occurrences and achievements, the history of events, which happened in those places and in those times, but which can't be repeated anywhere and always. This history has a unique character, and this uniqueness is the expression of the profound world-outlook sense.

3. Where do you think there may be a conflict between these two?

Science, according to its nature, exists for cognition. It is its main goal. But, science as technology begins to influence the life itself, its organization and its ideals. So, the *utopia* arises, as the plan of perfect organization of all the life according to scientific knowledge.

In religion, in some sense, quite the contrary happens. Initially, the cognitive element, is subordinated to the whole: to the right religious organization of life. In religion, the main goal – the salvation – is the *cognition of Truth*, as well. But, the cognition, here, is not pure intellectual activity. Here, the cognition of Truth means the existential embodiment of this Truth in personal life – the *communion* to the true being. So, from the point of view of religion, all the cognition is considered in the light of salvation. Hence, it may be a bad knowledge and a good one, not in the sense of the degree of understanding, but for example, from moral point of view, subordinated to the general religious perspective. Such an evaluation is impossible from the point of view of pure scientific cognition. In its turn, science, trying to consider the idea of salvation, can't make it otherwise, than according to the known laws of nature. This, one wants to say, asymmetrical involvement of science and religion in the same domains engenders the constant tension between them, leading in the worst case to the conflict.

4. What have been the grounds for the development of conflict between these two?

The grounds for the development of conflict between science and religion are:

α) the common spheres of consideration and the different natures of approaches (as it was explained above),

β) the ideological elements.

Both religion and science have the claim to be the complete truth. But the first has this right, generally speaking, and the last has not. So, when science fights for the domination above religion - it is the perversion of the nature of cognition itself: it is impossible to prove all, and to make all clear. There is the place for mystery in life, and, particularly, there are the places for the beliefs and believed presuppositions in scientific cognition, as well. The philosophy and history of science show such presuppositions to be the essential and necessary ingredients of the body of science.

At the same time, religion has to *estimate* the prerogatives of science. There is no deduction of scientific theories from the theological dogmas. When religion in the West (XIII-XV cent.) tried, at first, to construct – vainly – the strict *logical system* with theology in the base of scientific knowledge, and, then, to compel the arising science to choose the prescribed solutions of difficult scientific questions (XVI-XVII cent.), it was experienced as the violation of reason itself, and it led to the rebellion of science and, at the end, to secularization of all the culture.

5.What has been the role of religion in the development of science in the West?

The following moments, decisive for the development of Western science, were the direct results of the influence of the Christian worldview:

α) demythologization of nature,

β) development of classical mechanics,

γ) legalization of the idea of infinity in science.

Christianity of the Middle Ages was the spiritual and philosophical base for the demythologization of nature. The supreme power of Christian God, Creator, opened the way for overcoming Aristotelian approach to nature. The first decisive step had already been made in 1277, when Paris' Bishop condemned 219 propositions, based on the Aristotelian worldview. In particular, the deification of heaven opened the way for making a unified physics for the heavens and the sublunar region. The qualitative Aristotelian natures of the things were replaced by the homogeneous inert matter of XVII-XVIII century mechanics. It was especially accent on God's omnipotence in Protestant theology that promoted the genesis of the classical mechanics and mechanistic worldview. (But, at the same time, this one-sided theological view was the reason for the future impasses of mechanistic philosophy, scientistic ideology, ecological problems, etc.).

The medieval speculative theology opened the way to legalization of actual infinity in science. This process led to the invention of the differential and integral calculus – the base of modern mathematics and natural sciences. In the discussions of twentieth century's critical mathematical problems, one can comprehend these theological roots of the idea of actual infinity in modern science. In the works of the founder of the set theory, George Cantor, one can especially see the great importance of theological thought for the philosophical thinking about the foundations of the *transfinite arithmetic.*

6. Can we have a religious science?

We can't have a religious science in the following two senses:

α) science, as religion,

β) religion, as science.

Both ways mean, at the end, the understanding of religion, as some kind of knowledge. Such a *gnostic* view on religion was strictly condemned in Christian theology. The main goal of religion is not knowledge, but *salvation.* The salvation demands from man to perform the holistic personal *act of faith* and to live according to God's commandments. This personal act can't be algorithmized; it can't become the result of application of some formal impersonal knowledge. The salvation, as a sanctification of life, as the union between the being and God, has its own cognitive "projection", but can't be reduced to it.

7. Can science dispense with religion?

No, it is impossible to dispense science with religion. Well-founded science has to formulate its own philosophical presuppositions. This hermeneutical procedure (both in linguistic and in ontological sense) leads to formulation of some necessary conditions of knowledge, which have pre-religious sense: the existence of truth, the possibility to know the truth by human reason, and some other more special ones. The determination of the concrete historical and cultural coordinates of these presuppositions helps to understand the links between the great religious traditions and the scientific schools. Like the rivers which begin in mountains, on the *watersheds,* so there are the religious *watersheds of thought* (the term of Russian religious philosopher of XXth century the Rev. Pavel Florensky), where the big traditions of scientific thought begin from.

8. Can one separate the domains of activity of science and religion completely?

Definitely no. Religion, as the most profound link of the being and sense, the being and values, is an inevitable base for any possible understanding and consideration of reality. Everything has a religious sense. I am sorry, even *Pepsi Cola* has a religious sense. But, especially such a great human enterprise as science cannot be completely separated from religion. The forced separation of science and religion leads to:

α) the shallowness of science,

β) the overestimation of the power of science, the development of scientific ideology-scientism,

γ) the isolation of religion from culture, reduces the religious life to the regular from of worship.

Prof. Terence Gerard Kennedy

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1. What is your definition of science and of religion?

Science for me means the systematic study of the natural world, that is, the world of physical as well as psychic and social phenomena. It includes the disciplines found in the modern university such as physics, chemistry, computer science ... biology, ecology ... psychology, psychiatry ... economics, sociology ... etc. This is not science in the sense of philosophy as it was understood in the ancient (Aristotle, Plato), and the medieval world. Science in this sense is often referred to as "modern science", as the type of thinking begun by Galileo and Newton. It is characterized by experimentation with precise measurements that can be mathematically interpreted. It is therefore rational in a quite precise sense and without it modern technology would never have been possible.

Religion has many meanings. It can be any system of symbols and beliefs that gives sense to the universe and to one's life. An ideology such as communism is sometimes referred to as a "religion" because it is a life-guiding philosophy. Religion in the strict sense is the result of faith in God. In the light of faith, the universe becomes intelligible as God's creation and moral action as doing God's will. Religion is an organizing principle for social and personal life on the basis of faith in God.

2. Do you see any conflict between your definitions of these two concepts?

I do not see these two concepts as fundamentally in conflict. I see a distinction between them. Science, for example, studies the natural world and it can study religion and religious behaviour as a phenomenon in the observable world. But it can never establish that God created this world from nothing. That depends on faith. It is obvious that there will be moments of tension to be resolved in the history of how science and religion relate. They can help and should enlighten each other mutually.

3. Where do you think there may be a conflict between these two?

There will be conflict where science leaves no space for religion, i.e. when a scientist believes it is only possible to do science if one is an agnostic or an atheist. Religion causes conflict with science when it denies that science is not a valid way to research the phenomena of the natural world; if it thinks that faith provides all the answers and we have no need of science to understand the phenomena of nature.

4. What have been the grounds for the development of conflict between these two?

The grounds for conflict are largely historical, at least in Europe. The type of science advanced by Galileo and Newton was something new that the medievals had not thought about in their schema of knowledge. To establish itself and its autonomous authority, this new science felt it had to rebel against the authority of the Church and scholastic theology which was predominant in the culture of the time. Once science's proper authority and autonomy have been recognized, "the war of religion and science" ceased. Conflict today centers more on whether one has religious faith or not and how one consequently views science.

The development of biotechnologies has lead to new conflicts. Previously birth and death were religious moments that brought people close to God. They are now manipulable by the new technologies so that many believe, wrongly, that God's power has been limited and that humans have assumed complete control of their destiny. The challenge is to show how these new technologies are to be used while observing God's law for what is best in the development and evolution of humanity.

5. What has been the role of religion in the development of science in the West?

Religion played a vital role in getting science started in Europe. The doctrine of creation was the key. God created an orderly, contingent world. In other words, there are rational patterns in the natural world. But since God created the world freely i.e., he did not have to create this world as it now is but freely, chose to do so, the orderly patterns in nature can only be understood by examining them in their uniqueness and discovering how they work. So it is necessary to make experiments in order to grasp the order in a contingent universe. Christian faith is based on unique historical events, that God became incarnate in Christ. Christian faith taught that God has loved the world bringing it into existence from nothing in and through Christ. One can only discover the meaning of events by examining their actual historical reality. The whole universe, too, on the basis of a Christian understanding of the history of salvation can only be explained through its history. Christian faith provided many of the tacit presuppositions needed to get science launched. Medieval philosophy in its Islamic and Christian forms also helped by providing many of the intellectual tools needed for the "birth" of science, e.g. the relation of universal to individual in logic. Many great scientists were inspired to undertake research and even to propose scientific theories that they saw as consistent with their faith-vision of God's universe.

6. Can we have a religious science?

Not in the strict sense. Science has its own proper principles and ways of understanding. Religious faith can however provide motivation for practicing science, as well as an understanding of the presuppositions that make science possible. Scientists, whether believers, atheists or agnostics, can all understand each other on the level of science and its logic. They are all part of one great enterprise we call "science". Once the principles of science have been firmly established by logic and experiment, it is not necessary to invoke a faith-principle to render them internally coherent.

7. Can science dispense with religion?

No! Science can explain natural phenomena but cannot by its own resources alone discover the ultimate meaning of the universe. That goes beyond the experimental methods practiced by science. This lack of an absolute horizon in science may function as an opening to faith because it raises the question of ultimate purpose. For instance, science may go back to the first instance at the origin of the "Big Bang" but that is not the same as God creating the universe from nothing. We could say that while it helps us know about God, it does not introduce us to God personally. One of faith's functions is to shed light on science as part of our destiny.

8. Can one separate the domains of activity of science and religion completely?

No! Separation means division and therefore lack of contact. We human beings are complex entities, with many components going to make the one unit. It is better to speak of a "distinction" between religion and science rather than "separation". Or perhaps of different levels of understanding and meaning, and that should lead to dialogue and mutual understanding.

Dr. M. Zaki Kirmani

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Education: B.Sc., A.M.U. Aligarh (1970); M.Sc. in Chemistry, A.M.U. Aligarh (1972); Ph.D., Indian Institute of Technology, Dehli (1979).

Publications: Chairman, Danishgah-e-Urdu, Aligarh (a university-level open education institution); He was the Editor of *Journal of Islamic Science*, Aligarh (from 1985 until 1998).

Postgraduate Experience: Seven Papers on Chemistry; 20 Papers on theoretical aspects of Islamic Science. He is the author of *The Qur'an and the Future of Science* (in Press).

1. What is your definition of science and of religion?

My definition of Science and Religion is as follows:

Science: Science is man's study of things and phenomena by way of observation and experience, for achieving certain individual and/or collective objectives.

Religion: Influencing man's individual and collective behavior, action and knowledge. Religion is consciousness of a Supra Natural which shapes man's view of himself, his position in the universe, and his relation with things therein.

2. Do you see any conflict between your definitions of these two concepts?

Things and phenomena studied in science through observation and experience do not and cannot reveal total picture of reality. The relationship of things and phenomena to man and even their interrelationship can't be adequately comprehended by scientific method. In fact, this aspect is dealt with religion. Hence, for a truer picture to emerge it is necessary for science to operate in an atmosphere illuminated by religion. It means that we will have to seek religion's help in formulating concepts with regard to nature, its various phenomena, its relation with man and other possible dimensions, which can't be known otherwise. Latest manifestation of the lack of comprehensibility is the crisis in health care system and environmental issues which are a result of the overestimation of observation-experience based method employed for knowing things and phenomena. Science is not operative in religious atmosphere; it rather denies the legitimacy of religion in such matters. This appears as an essential conflict in these two definitions.

3. Where do you think there may be a conflict between these two?

Following comparative chart shows the conflict between these two:

Religion:

1. Consciousness of a supra natural is vital.
2. Man's behavior is shaped by revealed knowledge or its consciousness.
3. Worldview is shaped by revealed knowledge or its consciousness.
4. Religion provides man with fundamental guidance in shaping its views and relation with regard to things in nature and thereafter sets man free to explore through sensory method.

Science:

1. The consciousness of supra natural is insignificant.
2. Man's behavior is shaped by views developed on the basis of observation and experience.
3. Worldview is shaped by ideas developed on the basis of observation and experience.
4. Science does not accept the guidance and explores things totally independently, and without any a priori view.

4. What have been the grounds for the development of conflict between these two?

Science is basically a demonstration of man's yearning to know and understand whatever he sees and finds around him. And this thirst for knowing is so strong that can't be quenched merely by revealed knowledge. Man in fact needs to observe and experience and use his sensory power in his quest for knowing.

However, when man begins to explore through observation and experience, he fails to confine himself and begins to give meanings and purpose to it. In doing so, he in fact transgresses. Merely to know *how* things are going on, he ventures into *why* these are so going. Though these two are quite distinct areas but nevertheless, are likely to overlap if the doers are not conscious.

To answer *why* is in fact tantamount to assigning motives, and purpose and as man himself is not operating the things and phenomena under study, this assignment remains not only tentative but also unauthentic and therefore runs a great risk. Answers pertaining to questions as to *how* things are going on are by and large experimentally demonstrable and knowable. Rather, this is the only way of knowing them. But those related to *why* are not so. In this realm, when man ventures, commits mistakes and results are catastrophic. *Why* is normally answered by religion. There is a kind of *a priori* guidance which provides man with a safe and secure ontological foundation. However, science being opposed to such knowledge does not accept it and adopts its own method even in these areas.

This obviously leads to conflict. If the religion is not authentic and does not have guidance in such issues, it either wages a sort of war against science or becomes totally subservient. In such atmosphere, a vertical growth of science is observed resulting in a totally unhealthy and chaotic social matrix at horizontal plane. In sound religious tradition, if existing at time, this science fails to find room. If on the other hand, the science grows in a religious culture, it finds no need to venture into such areas and a healthy growth of science is observed.

5.What has been the role of religion in the development of science in the West?

Religion in the West having no definite ideas about man and nature, and having given no freedom to its adherents to derive and develop such ideas, could not face man's legitimate urge and first resisted with power and later succumbed to the pressure. Role of religion vis-à-vis science, was initially negative and finally reduced to almost naught in Western man's intellectual ventures.

6.Can we have a religious science?

Yes, we can have a religion based on science provided following are accepted:

a) Man needs guidance for its action and behaviors as this knowledge is beyond his comprehension based on experience and observation alone. This guidance is available through religion.

b) Who the man is? What for is he? How is he related to the fellow man? And how the things around are related to him and what basic message do all phenomena convey? These and all other similar questions are beyond man's scientific explorative ken. Tried independently man can have only partial and disjointed answers leading to tension between man and every other thing. Man's quest in this realm will be fruitful only if religious knowledge is sought and accepted as the starting point.

c) Some aspects of the knowledge are rooted in supra natural sources whereas for some others, man has to use his own potentials.

Once these basic principles are accepted whatever is produced scientifically, will, broadly speaking, be religiously scientific.

7.Can science dispense with religion?

Dispensed with religion, as the contemporary science is, it has become an essential source of tyranny, hegemony and violence. Being the main tool of political economic and cultural imperialism modern science, just can't continue to dispense with religion if there is peace and harmony in the store for man's future in this world.

8. Can one separate the domains of activity of science and religion completely?

This is impossible. Religion is innate in man and to do science is his basic need. As man's mind is involved in religion and so also in science, this organ can't be thought of responding completely separately and independently while switching over from one urge to another. In fact, not only the mind works in unison, but also various urges influence one other. Those who believe in separation, they in fact believe in distortion and harbour a dualism in their individual and social life.

There is yet another aspect of the question. This is concerned with the contemporary issues like the choice of the problems for R and D, priorities of funding, science policy making, etc. All these questions have direct link with the national and cultural consciousness which is constructed mainly by the religion, the people adhered to.

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Post-Doctoral Professional Experience: Family Medicine Residency (1982-85), University of Missouri/Columbia, Geriatric Medicine Fellow (1986-89), Duke University Center for Aging and GRECC VA Medical Center; Residency in Psychiatry (1989-92), Duke University; Professor of Psychiatry and Behavioral Sciences and Associate Professor of Medicine, Duke University Medical Center; Director, Center for the Study of Religion, Spirituality and Health, Duke University; Adjunct Professor, King Abdulaziz University, Jeddah, Saudi Arabia; Visiting Professor, Shiraz University of Medical Sciences, Shiraz, Iran. Former Editor-in-Chief of the *International Journal of Psychiatry in Medicine* and also of *Research News & Opportunities in Science and Theology*.

Awards: Fellow Award (1990-92), American Association for Geriatric Psychiatry; NIMH Clinical Mental Health Academic Award (1993); RO1 Predicting Depression Outcomes (NIMH).

Publications: Include 53 books, nearly 100 book chapters, and over 525 peer-reviewed articles. He is the editor of the *Handbook of Religion and Mental Health* (Academic Press, 1998), and author of three editions of the Handbook of Religion and Health by Oxford University Press (2001, 2012, 2021).

Science without religion is lame, religion without science is blind.

Albert Einstein

1. What is your definition of science and of religion?

While for many years, science and religion had been diametrically opposed, they are now being used to complement and reaffirm one another. Religious professionals are beginning to see the value and contributions of science, both the physical and health sciences, that enrich and validate religious values and principles. Scientists, on the other hand, are beginning to see the limits of rational thinking, the meaninglessness of their findings divorced from religious tradition and ethics, and the shallowness of goals separated from the light of religious truths.

Definitions:

Religion involves the beliefs, practices, and rituals that define one's relationship to God and to other humans. Religion is what we center our lives around and devote our lives to. Religion is what gives meaning to life's goals and hopes. Religion is what makes humans different from animals, because it forces us to recognize something greater and beyond ourselves.

Science involves the process of acquiring knowledge or truth by systematic observation, study, and experimentation carried out to determine the nature, principles, or laws that govern the physical, psychological, social, and moral universe in which we live. Two major branches are the natural or physical sciences and the health sciences.

2. Do you see any conflict between your definitions of these two concepts?

There is no conflict, as long as the limits of each concept are understood. Religion involves the operation and principles that govern the non-physical world that we live in. Science deals primarily with the physical world that is observable and measurable. Science cannot prove or disprove religion, which is accepted or rejected on the basis of intuitive knowledge or faith. Religion, however, can provide meaning to and guidance for the discoveries of science and their application. Science, in turn, can provide validation for universal laws and principles that govern interpersonal relationships and intrapersonal hope and meaning. Science conveys truth through the study of small parts of nature, largely isolated from other parts of nature; reductionism is required by science to tease apart the many interacting processes that impinge on and potentially bias their many small truths. Religion conveys truth and knowledge through intuitive and global processes (often stories) that make sense of and synthesize the many small truths into the overall Truth. While science provides the answers, religion provides the answers behind the answers.

3. Where do you think there may be a conflict between these two?

Only when one discipline seeks to devalue the importance of the other. Discipline.

4. What have been the grounds for the development of conflict between these two?

Science and religion come into conflict only when their adherents try to use them to achieve goals which they were not intended to achieve - for example, when science is used to try to prove that God exists, or when religion is used to explain the purely physical domain of nature, rather than the meaning behind it.

5. What has been the role of religion in the development of science in the West?

Science in the West largely developed out of a reaction to the people's abuses and misuses of religion. Science was a new way of finding truth that was divorced from the opinions held by powerful, influential others, often in the church. As scientists have become more open to religion as an explanation behind the explanation, they are beginning to find much greater beauty, purpose, and design in what they are discovering.

6. Can we have a religious science?

Only if the study of religion uses religious tools (prayer, meditation, etc.) can it study itself. Religion can accumulate knowledge, yet it is different from the reductionistic "part" knowledge that science can achieve. On the other hand, science can be used to study the physical, psychological, and social effects that religion has on humans, without making claims to the ultimate origins of such effects. Nevertheless, science cannot use the tools of religion to accomplish its goals; it must remain objective.

7. Can science dispense with religion?

Science can certainly try to dispense with religion. It has, indeed, tried to do this for centuries. As we learn more and more through science, however, we begin to see how little we actually know. Scientists must then turn to religion to make sense of what they cannot. Also, religion is necessary for science to understand how to apply and use its findings for the ultimate advancement of mankind.

8. Can one separate the domains of activity of science and religion completely?

No. Because the parts of nature that science attempts to isolate and explain, are parts of a greater truth that only religion can understand, describe, and convey to humans.

Prof. Kalervo V. Laurikainen[1]

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Education: Cand. Phil., 1940, University of Helsinki; Ph.D. in Physics, 1950, University of Helsinki.

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[1] Prof. Laurikainen died a few months after sending his article to us.

1. THE UNITY OF MATTER AND PSYCHE

(Reflections on the Unus Mundus of Jung and Pauli)

As the correspondence of Wolfgang Pauli and C. G. Jung was published in 1992, it has been possible to form a more detailed picture of this exchange of ideas which continued for over a quarter of century. Characteristic of it is the idea of *one world*: an ontology where the whole human consciousness (and in principle even the unconscious) is considered as an inseparable whole. Thus, the subject searching for knowledge and the object of this knowledge are considered as united in a whole. Pauli arrived at such thoughts on the basis of *complementarity* uncovered in microphysical observations, Jung from his psychiatric work. I shall here describe Pauli's point of view because I know it better.

Experimental results of microphysics

Pauli started from certain experimental facts which force us to change our opinions about knowledge and reality.

Complementarity

The microworld can only be described symbolically, because it is an invisible world, and its properties can be defined only within the framework of a given theory. The best knowledge of the microworld is obtained on the basis of experiments planned according to quantum theory, and there is no possibility of comparing this knowledge with "reality itself". In addition, different experimental results can give incompatible results (complementary to each other). Because of this situation, reality cannot be described in detail within a rationally acceptable theory – it seems to become dim when one tries to examine it very accurately (the uncertainty principle of Heisenberg).

This feature is not caused by the imperfection of quantum mechanics but is a property of nature itself. This was the basic philosophy of the *Copenhagen interpretation* from the very beginning, and during the subsequent 70 years it has guided the interpretation of the theory and the development of the terminology describing experimental situations.

It is true that according to Einstein's opinion, quantum mechanics is not able to describe microreality completely and, therefore, one should try to develop a more complete theory for microphysics, but experiments carried out later on (the so-called EPR experiments) have not supported his vision of physical reality. Although it is not possible to develop a theory which would correctly describe the details of the microworld, it is however, possible to derive from quantum mechanics *statistical laws* for macrophysical phenomena in a highly reliable way. The quantum mechanical laws are found with the aid of "matter waves". These waves do not describe individual phenomena in detail but do give excellent statistical predictions which concern a great number of "similar" atomic phenomena. Which phenomena are considered "similar", must be defined with the aid of macrophysical experimental arrangements: these define a certain "situation" in which microphenomena are investigated (the *initial state* of the system).

A quantum phenomenon is always a jump from a given initial state to a final state, the last one being predictable only in a statistical sense. *A quantum phenomenon is an indivisible whole* which cannot be described in detail. In the new interpretations proposed to replace the Copenhagen interpretation, attempts are in general made to also describe changes of state in the assumed process between the initial state and the final state. However, according to the basic philosophy of quantum mechanics, we cannot expect a development of the theory in this direction which would mean approaching determinism again, i.e., presupposing that a detailed description of individual events is possible with arbitrary accuracy.

Although the predictions are only statistical in quantum mechanics, they make it possible to govern "atomic phenomena" in a practically reliable way, even to develop atomic technology. Therefore, we can claim that *microphysical theories give us knowledge of reality.*

Conclusion: *A microphysical theory does not reach "reality itself" but describes it only symbolically. Nevertheless, it contains knowledge of reality in the statistical sense, and this helps us to govern actual "atomic events".*

2.The Basic Nature of Reality

Is it, then, possible to claim that we can obtain knowledge of reality in the ontological sense? Is the world, by its basic nature, "material" or "spiritual" or perhaps something else?

Bohr thought that this question does not belong to physicists. We must maintain the objectivity of physics and, therefore, avoid ontological debates. *Heisenberg* and *Pauli*, instead, seem to have thought that it is not possible to avoid ontological questions. In fact, the perhaps most profound question of our time concerns the search for a conception of reality which is even compatible with the results of atomic research. Only physicists can reliably approach this problem.

The situation in the interpretation of quantum mechanics shows that it is not possible to describe the nature of matter without also speaking of the shaping activity of the psyche. The picture of the atomic world which we construct gets its form in the human psyche and reflects, therefore, both the properties of the psyche and the structure of the 'material' world which it aims to describe.

The basic question is: *How are the concepts created which make it possible to describe reality 'correctly', i.e., in such a way that this description corresponds to the structure of reality, and how can we find the 'right' natural laws?* The existence of the outer world is self evident for a physicist. It must have a certain structure which we must try to describe 'correctly', although we know now from the atomic theory that such a description can only be symbolical. What is the bridge between our knowledge and reality?

Pauli spoke of a *cosmic order* which governs both the functioning of the human psyche and the phenomena of the outer world. Analogously, Heisenberg used the term 'central order' (zentrale ordnung). Pauli found *archetypes*, which play an important role in Jung's psychology, to be the basic elements of that cosmic order. They can be compared with the ideas in Plato's 'world of ideas'. The essential difference is that the cosmic order is not invariant: the archetypes are basic elements in a world of changes, and characteristic of them is a dynamic force which creates changes both in the human psyche and in the outer world.

3. Complementary Ontology

Pauli's ontological vision maintains the idea of *Cartesian dualism*, insofar as the contrast between physical and psychical is very clear. For a natural scientist, the existence of an objective reality – which is independent of our knowledge and of our decisions – is a kind of basic belief, the starting point and the moral backbone in the search for knowledge. That independent reality we try to describe with the aid of quantum mechanics. Atomic research has shown, however, that we cannot reach independent reality with the aid of empirical methods. Here we must agree with *Kant*'s conception of knowledge that the "things-in-themselves" cannot be reached by empirical science.

The essential difference with respect to the Kantian philosophy is, however, that statistical causality opens the possibility of getting statistical knowledge of reality.

Pauli used the description of the microworld as a model for ontology. In microphysics we have met a reality which manifests itself as complementary, incompatible properties – for example, in some situations as a world of localizable particles and in some other connections as nonlocalizable waves. We cannot describe the ontological nature of such a world but must be satisfied with the complementary descriptions in different situations. However, there is a theory – quantum mechanics - which fulfills high requirements of rationality and helps us to govern all atomic events. This shows that there is a coherent microworld which appears to us in different situations in very different and even incompatible ways.

Pauli then used this model in general ontology. The world appears to us in some connections as physical phenomena, in other situations as psychic experiences. Atomic theory has given us a lesson that reality can be an abstract whole, not describable in any rational theory. Even when describing physical phenomena, one cannot neglect the shaping activity of the psyche. Pauli spoke of a *psychophysical reality* which is an abstract whole but manifests itself as "physical" and "psychic" phenomena – like "particles" and "waves" in microphysics. This is a new ontology, the model of which is obtained from atomic theory.

"Physical" and "psychic" correspond in Pauli's terminology to the two basic substances of Cartesian dualism. According to Descartes, these substances are in principle independent of each other, but their mutual relation is, in fact, the weak point in Cartesian dualism. In complementary ontology, *reality is a transcendent whole*, indescribable in the framework of any rational theory. Its physical and psychic appearances can be described but the very nature of the reality itself cannot be defined. I would like to call this transcendent reality *spiritual*.

The repression of metaphysics, which for many people limits their scientific thought, makes them bound to the prevailing conception of science. Then the paradoxes in the interpretation of quantum mechanics remain permanent problems for which no satisfactory solution has been found. The natural solution for this situation is an essential change in the conceptions of reality and the nature of science. This presupposes metaphysical considerations. In this connection, new relations between different fields of culture can be found, even in questions which are now considered absolutely excluded. Here, I would especially like to point out the relation between science and religion, for which the ontology of one world seems to open quite new perspectives (Figure: Pauli's "World X").

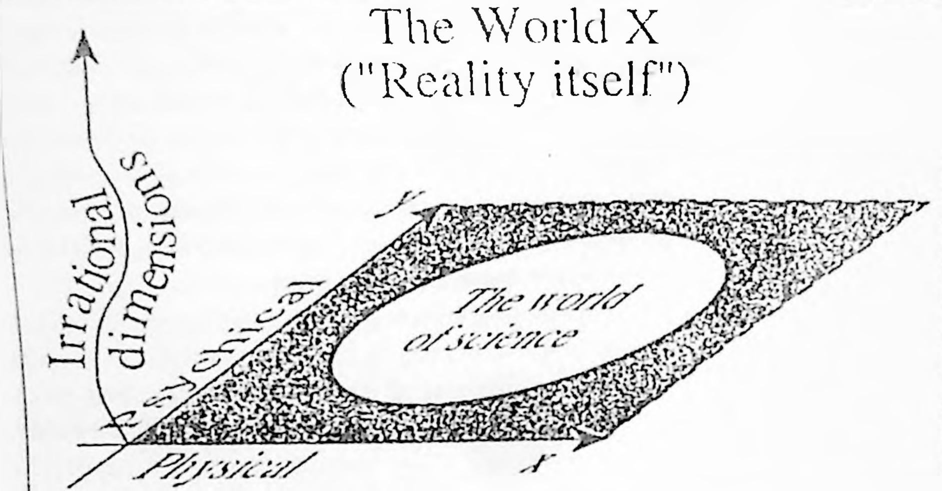

Figure: Pauli's "World X"

The rational world of science rests on physical and psychic perceptions and experiments. Its critical analysis has shown, however, that it is not possible to find explanations for all perceptions by using the scientific methods: a complete description of individual events is not possible. Therefore, the "reality itself" remains unreachable – transcendent. It contains irrational dimensions nondescribable by science. In figure, the "reality itself", or Pauli's "World X", is the three-dimensional space. The rational world of science is just a two-dimensional cut of reality. The irrationalities – or better: the irrational dimensions – are reachable only by faith.

My personal image of God: God is the same as reality itself, the basis of existence unreachable by reason. "In him, we live, and move, and have our being."

4. Science and Religion

As the starting point, we emphasize here the symbolic nature of all human knowledge, i.e., the transcendent nature of reality. In science, we must attempt to fulfill the requirements of rationality as strictly as the nature of matter allows, but one should always remember that even scientific description of reality is only symbolic and contains undefined elements. In metaphysics and even more in religious language, one must make compromise with the requirements of rational accuracy, and the symbolic nature of statements is obvious. Religious truths refer more to the heart than to reason. It is necessary to point out this difference if we wish to find a harmonic relation between science and religion. If we understand that knowledge, ultimately, is always just *symbolic description of the transcendent*, it is essentially easier to find such a harmonic relation than it is on the basis of the classical, "realistic", conception of science.

In the end, it remains a mystery that knowledge of the transcendent reality is possible. Einstein expressed this as an aphorism: "The most incomprehensible thing about the world is that it is comprehensible." In Christian terms, this is contained in the idea that *man is an image of God*. This can be interpreted as an expression of the cosmic order that, according to Pauli, is beyond the contrast of physical and psychic.

The metaphor "image of God", however, does not mean only matters of reason. Form the point of view of life, *willing* is even more important than reason. Schopenhauer has especially pointed out the ontological importance of will, and it is useful to remember Eino Kaila's "final balance" in his book *Syvähenkinen elämä [The Depths of Spiritual Life]: "All life is willing and will is the same as belief."*

The idea of statistical causality incorporates the idea of a creative cooperation of reason and will. Causality described by the wave function represents reason (rationality); the "choices" which take place in individual phenomena represent will. The cooperation of reason and will creates "actual" events which are not predictable. This describes God's creative activity in the world: *continuous creation* of something new. Nothing prevents believing that *teleology* is a characteristic aspect of this creation, especially in life phenomena.

In the Protestant theology, in particular, one is accustomed to thinking that science and religion belong to different spheres of reality which do not have anything to do with each other. Because of the new conception of causality, it is again easier to understand that we can find God even in science.

For me, God is the same as reality itself – the basis of existence. He is "I am" (Exodus 3:14) – a *transcendent, hidden God*, but certainly he is a participant and active in this world where we live and which is the object of science. Thus, although he is transcendent, he is simultaneously *immanent*. In fact, one can say that everything is and takes place in God. According to a Jewish expression, God is the "place of occurrence". Or, in the words of St. Paul (Acts 17:28), "For in him we live, and move, and have our own being". (See figure on page 254).

The idea of one world emphasizes the importance of the psychic element in all knowledge that we can have of reality. However, a status equal to that of psychic things is acknowledged for the "physical" ones. This is characteristic of the Western thought which has created empirical natural science. In the Eastern thought, the outer world is considered secondary, and then the belief in an independent reality characteristic of empirical science grows weaker.

The emphasis on the outer world in the Western thought leads to an image of God who also speaks through his Creation and whose talk we must listen to when searching for truth. During modern times, the witness of nature has been almost forgotten in theology. The relation between science and religion has become unnatural, and this has resulted in the secularization of the Western world.

In phenomenological philosophy (Husserl, etc.), the emphasis is put on the reality of the inner world – as in the Eastern thought – as if the human consciousness could freely give structure to reality. Then the idea of God's speaking through his Creation becomes dim.

Pauli's idea of complementary reality is based on the belief that reality has a given structure. We must acknowledge this and try to describe this structure "correctly" although it remains transcendent for us. We experience reality as psychic and physical phenomena, but we cannot describe its basic nature with any rational concepts – save in the sense of a symbolic description.

Beside rationality, the *irrational will* is characteristic of reality. Will is a creative, free element which manifests itself both in the human behaviour and in nature: in the free choices. It makes reality a changing world: reality has both rational ("being") and irrational ("becoming") aspects. Grace belongs to the irrational aspects; God's Grace is stronger than Law but does not, however, violate it (Matthew 5:17).

In order to create, will must cooperate with reason. The human will without belief is powerless. A decisive factor is the basis of belief, its direction: towards God or away from Him. This choice is more a matter of the heart than of reason, and the message of the heart cannot be misinterpreted: *God is the source of love.* This is the very mystery of creation. Under the power of selfishness, reason destroys: only in the service of love can it create.

Rev. Prof. Ian S. Markham

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Professional Experience: Dean and President of Virginia Theological Seminary (August 2007 to Present) ; Dean of Hartford Seminary and Professor of Theology and Ethics (August 2001 to 2007) ; Foundation Dean and Liverpool Professor of Theology and Public Life at Liverpool Hope University (December 1998-July 2001) ; Liverpool Professor of Theology and Public Life at Liverpool Hope University (September 1996-December 1998) ; Lecturer in Theology at University of Exeter (September 1989-August 1996); : Fellow, King's College, London (July 2013); Visiting Research Fellow at The Institute on Religion and Public Life in New York (Huly-September 1991).

Publications: More than 60 articles; More than 14 monographs and books ,including Against Atheism:_Why Dawkins, Hitchens and Harris are Fundamentally Wrong (Oxford: Wiley-Blackwell, 2010),Truth and the Reality of God (Edinburgh: T&T Clark 1998), Go Ye Into All the World: Faith and Engagement (Alexandria: VTS Press, 2011),_Do Morals Matter? A Guide_to Contemporary Religious Ethics (Oxford: Blackwell 2007), Encountering Religion; Joint editor with Tinu Ruparell (Oxford: Blackwell 2001), A World Religions Reader (Oxford: Basil Blackwell 1996) .and many edited collections.

1. What is your definition of science and religion?

There are many who argue that "science" and "religion" should be seen as very contrasting (see Langdon Gilkey "two languages theory"). My definitions of both concepts would want to take issue with that approach. Both science and religion are seeking the truth. And by "truth", I mean to provide descriptions that correspond to the way things are. Now naturally, this is difficult. So we construct worldviews, which we should hold with some humility, that seeks to explain the complexity of our experience of the world. The worldview that does this best is the one that is closer to the truth.

Both "science" and "religion" are involved in a shared quest for truth; and the different scientific and religious accounts can be judged by similar criteria. They should be judged by their internal coherence (does this particular account hold together or does it have self-contradictory elements) and by their explanatory power (does it explain the complexity of the data - the many elements of our experience).

The differences are mainly one of scale. Science tends to focus on the "local" - the immediate human experience as seen in the physical world; Religion tends to focus on the "transcendent" - the way in which the physical world is enfused with the spiritual. But even here, when one looks at some of the work of astrophysicists (in discussing black holes or parallel universes), the approach is much more similar to a theologian than it is to an engineer who is designing a bridge.

So in summary: science can be defined as an attempt to explicate the complexity of the world focused on local and physical causation. Religion can be defined as an attempt to explicate the complexity of the world that takes into account scientific insights, but also recognizes that the physical is infused by the spiritual and seeks to provide a more comprehensive account of reality.

2. Do you see any conflict between your definitions of these two concepts?

There is no reason for a conflict between science and religion. The story of conflict emerged because some religious adherents were too tied to a certain religious model of the universe (the world must have been created in seven days) or some secularists wanted to use science as a weapon against faith (scientific explanations, they argued, have made religious explanations unnecessary). It is important that religious adherents recognize that their interpretation of their Scripture in the physical realm needs to be held with some humility and be willing to be modified in the light of new information and evidence; it is also important that secularists stop imagining that the spiritual realm is false. The mysteries of consciousness cannot be explained by reference to scientific reductionism. The best science is clearly vindicating a view of the universe that can properly be described as spiritually infused.

3.Where do you think that there may have been a conflict between the two?

The traditional areas of conflict are in the following areas. These are:

Divine Action. In what sense can an immaterial entity such as God enter a physical system and, for example, bring about a response to pray and do a healing?

Creation. The origins of the universe.

Eschatology. The likely ends of the universe.

The conflict arises in these areas because it is where the local connects with the ultimate.

4.What have been the grounds for the development of conflict between these two?

The conflict at the extremes is easy to see. Interestingly, it is not a place where the majority of religious people and the majority of scientists operate. However, at the extremes: you have conflict when a religious person is so tied to an interpretation of a text (so in Christianity - a reading of Genesis 1 that sees it as crude seven day history of the origins of the world) that they cannot accommodate the theory of evolution or the archaeological record of the age of the universe. And you have conflict when a scientist refuses to consider anything except a materialist and reductionist explanation for the world. Interestingly, over the last thirty years, both religion and science has shifted. Religious people understand that they can still believe a text is a revelation from God without insisting that their particular interpretation of that text is the only way it can be read. And with the New Physics and an awareness that reductionism is simply mistaken (and top-down causation is an option), science should be open to the concept of spiritual causation.

5. What has been the role of religion in the development of science in the West?

Science depends on religion. Science makes two assumptions about the world. The first is that the world is stable, predictable, and continues to exist from moment to moment to moment. The second is that there is an explanation for things that happen in the world. It was Nietzsche who pointed out that these are both religious assumptions. And, argued Nietzsche, given religion is no longer culturally available to us, we cannot trust these assumptions. And given that, then science as a truth telling medium about the world is no longer plausible. For Nietzsche, once religion went, science went as well.

Nietzsche was right about this. His mistake was to assume that religion is no longer plausible. The language of a source of everything that is (this is what we all mean by God) still makes sense. And this source is the guarantor of two assumptions that science needs to make about the world.

6. Can we have a religious science?

It is probably better to say that a religious person can be a scientist. And in certain areas - divine action, creation, and eschatology, both religion and science need each other. The quest is for an "as complete explanation as possible" of the world in all its complexity. To this work, we need both the religious person and the scientist.

7. Can science dispense with religion?

No. Science cannot do this. Historically, it was the monotheistic claim that the world was created (and therefore a result of an agency of reason) that created the assumptions for science to operate. If religion is false, science is as well (Nietzsche was right about this). The mysteries of this world needs religious insights.

8. Can one separate the domains of activity of science and religion completely?

No. This is a popular position in the science and religion debate. But it is damaging. The two domains should be seen as running in tandem - working together. One is more local; and the other more metaphysical. But the difference is primarily one of scale, not of approach or methodology.

Prof. John A. McIntyre

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Education: B.S. in Electrical Engineering (1943), University of Washington; M.A. and Ph.D. in Physics (1945-1950), Princeton University.

Post-Doctoral Professional Experience: Assistant Professor (1957), Associate Professor (1960-63), Department of Physics, Yale University; Professor of Physics (1963-95), Texas A & M University; Associate Director for Research (1965-70), Cyclotron Institute.

Awards: College of Science Distinguished Teaching Award (1989).

Works: 53 scientific papers, 64 talks and 8 patents.

1. What is your definition of science and of religion?

2. Do you see any conflict between your definitions of these two concepts?

I am going to omit any response to questions 1 and 2 since they are concerned more with philosophical than scientific issues. On the other questions, I am pleased to offer the following answers.

3. Where do you think there may be a conflict between these two?

I do not anticipate any conflict between science and religion. For Christians, the content of religion is taken from the Bible. According to St. Augustine (about 400 A.D.), if "*the faithful report of the senses*" (science) disagrees with an interpretation of the Bible, then the Bible should be reinterpreted to agree with science. Consequently, there can be no conflict between the Christian religion and science.

4. What have been the grounds for the development of conflict between these two?

The conflict for Christians has occurred because some Christians will not interpret the Bible to agree with science. Today, for example, some Christians insist that the world was created in six literal (24 hour) days because the first chapter of Genesis says that God created the world in six days. This interpretation leads to an age for the universe of about 5,000 years instead of the 15 billion years obtained by science. Most Christians would say that the message of Genesis is to say that God, as Creator, is greater than any of his creation such as the sun or the moon, which the nations around Israel were worshipping. The six days would be, then, a literary structure on which this message was presented.

5. What has been the role of religion in the development of science in the West?

The Christian religion was crucial for the development of science in the West. The Greeks had taught men how to reason with Euclidean geometry

(300 B. C.) being a supreme example of the power of Greek thought. But the Greeks did not discover the means to investigate nature with the scientific method. Several Christian insights were necessary to proceed from Greek thought to scientific investigation.

a) First, Christians based their attitude toward nature on the Genesis account of creation which said that God had created the world and then announced that it was good. In contrast, the Greeks placed a higher value on ideas than on the material world. Thus, geometry was an idealized discipline with a line having no width and a point no extension. But, when the material world was concerned, the Greeks would not do such a simple experiment as drop a heavy object and a light object to learn which would reach the ground first. They just assumed, in contrast to reality, that the heavy object would fall faster. Galileo in Italy (1600 A.D.), on the other hand, with his respect for the material world, did drop two objects and found that both the heavy and the light object reached the ground at the same time. Once this experiment was understood, the science of mechanics was born and subsequently the rest of modern science.

b) Second, for Christians, God the Creator was sovereign. The only way for man to learn about the creation was to investigate it. In contrast, the Greeks assumed that all the motions of bodies in the heavens were circular since the circle was the "perfect" shape and the heavens were divine. Kepler, the Christian, found from accurate astronomical data that the orbits of the planets around the sun were ellipses.

c) Third, because of Genesis, Christians believed that man was created in the "image of God". Thus, Christians were confidant that they could understand the creation since their minds were images of God's mind. Kepler devoted 20 years to studying the planetary orbits before discovering that these orbits were elliptical. He avoided discouragement by saying that "*he was thinking God's thoughts after him*".

d) Fourth, because God had created the world, nothing in the world was sacred for Christians. There were no "sacred" groves or "sacred" cows that could not be taken into the laboratory for study. All of nature was appropriate for investigation. Of course, this did not mean that man was free to spoil his environment, for Genesis also said that "*The Lord God took man and put him in the Garden of Eden to work it and take care of it*".

6. Can we have a religious science?

I don't believe so. The Christian view is that science is the study of God's creation. There is nothing "sacred" in this creation, not the sun nor the moon, as mentioned in Genesis. Science, in St. Augustine words "*is the faithful report of the senses*".

7. Can science dispense with religion?

I would say so at this time. As discussed in the answer to Question 5, religion was crucial to the origin of science in the West. However, now that the procedures for scientific investigation have been developed, religion is no longer involved in scientific work.

8. Can one separate the domains of activity of science and religion completely?

Science and religion are separated completely from the scientists' viewpoint. However, for the Christian who believes in God the Creator, the creation is very much a part of his world view. The Bible is full of praise for the creation when it sings that "*the heavens declare the glory of God*". For the Christian, the vast creation is evidence of God's great power and glory.

Allamah
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Miṣbaḥ Yazdi

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Education: Preliminary education in Yazd; Advanced studies in Qum with Imam Ruḥullah Musavi Khumayni; studied Qur'anic exegesis and the philosophies of Ibn Sina and Mulla Ṣadra with 'Allamah Muḥammad Ḥusayn Ṭabaṭaba'ī (1952-1960). Studied fiqh with Ayatullah Bahjat (15 years).

Postgraduate Experience: Politically active from 1963- 1965 and from 1978-1979: writer and publisher of Bi'that and Intiqam periodicals. Member of the group of scholars and teachers of the Islamic Seminary of Qum; Joined and taught at the Ḥaqqani Seminary at the request of Ayatullah Bihishti (1967); Member the Office for Cooperation between the Hawzah and the University (since 1975); participated in debates against Marxism (1981); Member of 2nd, 3rd and 4th committees of the Council of Experts in Leadership of Iran; Director and Head of Imam Khomeini Educational and Research Institute in Qum (1995); Delivered lectures before the sermons of the Friday Prayers in Tehran (1997); Head of Supreme Council of Ahl al-Bayt World Assembly (1997-2012); Member of the Supreme Council of the Cultural Revolution; Member of the Society of Seminary Teachers of Qum.

Publications: More than one hundred volumes of books on subjects such as Islamic and comparative philosophy, theology, ethics, and Qur'anic exegesis.

1. What is your definition of science and of religion?

One of the greatest impediments in resolving problems in different sciences is the disregard of the equivocation of terms (i.e. terms that share the same semantic form). This leads to fallacies, misunderstandings, and unfruitful disputations. Both terms "science" and "religion" have multiple meanings and various usages in every language.

"*‘Ilm*" (علم) and its equivalents in other languages, such as "science", are usually considered as equivocal terms which have been subject to many variations throughout the history of human thought. In general, in all usages of the word science, the concept of "awareness" exists, of which the most general one is direct or intuitive knowledge *(‘ilm ḥuḍūrī)* and indirect or acquired knowledge *(‘ilm ḥuṣūlī)*. Aside from this general meaning, *‘ilm* has occasionally been made exclusive to the *‘ulūm ḥuṣūlī* ("acquired sciences"), or the *‘ulūm ḥaqiqī* ("sacred sciences", *scientia sacra*), or at times to the *‘ulūm kullī* ("universal sciences"). In Western civilization, for many centuries now, with the dominance of empiricism and scientism, a new meaning for *‘ilm* has emerged which has become established as being equivalent to the empirical sciences (*‘ulūm ‘tajrubī*).

In our view, empiricism is founded on serious epistemological errors, and to confine *‘ilm* only to the empirical sciences does not carry any logical justification; for if the intellect (*‘aql*) is not accepted as a reliable source of knowledge, then no school of thought, including empiricism, and no knowledge, including empirical science, could be taken as valid. Hence, for this very reason, our chosen definition for *‘ilm* is as follows:

Science (*‘ilm)* is a set of issues consisting of a subject and a predicate, whose subject matters are a subset of a single subject, whereby these issues would require an answer which either validates or invalidates them.Every effort within this framework is an effort to synchronise a specific *‘ilm*; and the source, methodology, objective, or even the conclusions that a researcher would arrive at does not necessarily have an inclusive or exclusive role of that problem or theory within the realm of that specific science; even though, naturally, all methodologies, objectives, and conclusions are not correct and only one response is correct for each problem. Certainly, *‘ilm* can be divided on the basis of methodology into the empirical sciences, intellectual sciences (*‘ulūm‘aqlī*), transmitted sciences (*‘ulūm naqlī*), and intuitive sciences (*‘ulūm shuhūdī*); or based on their objectives, they can be categorized into either the descriptive or the prescriptive (normative) sciences.

"*Din*" and its equivalent terms in other languages, like "religion", have been likewise defined in different ways. They include a variety of meanings: from a simple sense of belonging and attachment to a higher being; to a belief in the numinous; to a belief in the metaphysical realm and establishing a link with it; to a set of relevant beliefs and practical values; to the True Divine religion; to the contents of a revealed book and its concomitant Tradition; to beliefs and values focused on felicity (*sa'ādat*).

Since the primary objective of religion and the actual criterion for the need of religion is the recognition of felicity and of identifying the ways that lead to it, it can be said that the primary and central concern of religion is indeed those instructions which are bound to eternal felicity and the ultimate perfection of man. Thus, we define religion as follows:

"Religion is a set of beliefs, values, and mandated praxes which show man the way towards felicity and perfection." Different religions are all in agreement on this claim, even though they differ in defining true felicity and the ways towards it. On this basis, it can be said that if a religion introduces actual felicity and offers the correct directions for achieving it, it is a true religion and the rest of the religions are false. For the purposes of the discussion on the relationship between science and religion, what concerns us here is the true religion, which from our perspective is pure Islam.

The foundations of this religion are beliefs which include discussions grounded on a realist ontology and are described in the form of declarative statements (e.g. "there is a god", "God is One", "the Prophet has been sent forth by God", "there is life after death"), and they need to be believed on the basis of rational proof. Following these beliefs, a series of values (e.g. perfection, proximity to God, justice, continence, security) are proposed which are the natural requisites and results of the belief in those realities which must be upheld. Finally, based on these values, the performance of certain actions is advised, which is the prescriptive section of religion, including instructions on actions that are associated with beliefs and religious realities, their validity, and the direction of realizing the objectives and values of religion. Many of these mandated laws have been revealed from God and the Prophet of Islam transmitted it to others.

The tripartite classification, is based on an outline of a well-known definition, and presents religion as consisting of theology, ethics, and the rules of the religion. Likewise, the categorization of religion into principles of religion and their derivatives stems from the same view in relation to the doctrinal and operative teachings of religion and their interrelationship. In Islam, beliefs are like the "roots", values are like the "trunk", and mandated laws is like the "branches" of the tree of religion, and each section supplements subordinate portions further. With the centrality of the 'objective' mentioned in the definition of religion, it can be said that all teachings and details mentioned in the primary texts of religion (the revealed and the prophet's wonts) are prerequisites for reaching this primary objective — or are related to additional roles and responsibilities of the 'guardians' of religion.

"Methodology" is not an essential component for the definition of religion; and, for example, cannot form the basis of differentiation between science religion, and philosophy. In order to ascertain and recognize each of the three parts of religion, one must use the methodology relevant for those subjects. On account of the variety of sources for religious teachings, it can be said that the intellect, the revealed book, tradition, or intuition and experience, in relation to what directs man towards perfection and true felicity is named "religion". In this definition, the sources and methodologies of identifying different aspects and parts of religion are not exclusive to one source or methodology. Rather, for a problem under consideration, using the logical and epistemological principles, the source of these teachings can be reality itself, the intellect, the revealed book and traditions, or sensorial nature. Cognition and access to the teachings of the religion of Islam, for various subject matters, can be achieved through intuition, intellect (philosophy), transmitted, or empirical methodologies.

2.Do you see any conflict between your definitions of these two concepts?

Religion, along with its different definitions and the many factors which have been considered for it, has various connections with each of the different meanings of science. Of course, the preferred definitions of science and religion, that were mentioned, are not in conflict with each other, since firstly, each one according to their respected definitions, have their own subject matters and specific problems, and at the same time they both share certain subject matters and problems.

Secondly, from a methodological point of view, there is no incompatibility between them. In our definition, the methodology of science is not limited to the experimental method and neither has the intellectual and revelatory methodology been denied in it. The definition of religion too is not, restricted to the traditional method, the intellectual and the experiential methods have not been denied for it.

Thirdly, from the perspective of objectives as well, there is no conflict between knowledge and religion according to our view, rather they cover some objectives simultaneously.

3. Where do you think there may be a conflict between these two?

Based on the accepted definition for each one of science and religion, the realm of each one of them and their connection (with each other) will change. If we face two phenomena whereby their realms are completely independent and unconnected, we may consider them to be mutually exclusive, and thus there is no possibility of any conflict between them. But if these two (religion and science), act as intersecting circles, we are faced with two phenomena which have two independent sections and a common section. This commonality may be in subjects under consideration, problems, methodology or purpose. Anyway, the existence of commonality and simultaneous coverage results in the possibility of the birth of similar, complementary or conflicting theories, albeit in the same area. Of course, the possibility of conflict between various views is not restricted to science and religion, but it is possible to have conflicts in all theoretical (non-obvious) problems. It is possible for experts in all sciences to have conflicting views, which must be analyzed and their claims verified for validity or invalidity, using logical and scientific methods.

An important point that needs attention here is that whatever we know of religion, is knowledge attained through different sources of knowledge regarding religious subjects and problems. It is possible that these knowledge sets are based on certainty or surmise (with the gradations within); and are in accord with reality or differ from it. Propositions and theories in different sciences are also prone to this diversity. Propositions and attestations in each of science and religion, present judgements and assertions in relation to the realities and values. Axiomatic and certain propositions are undeniable, and the knowledge sets which accord with the reality cannot ever be in conflict with each other, whether they have been acquired through the path of intellect, or tradition, or experience or intuition. On the other hand, non-certain knowledge sets if centered on a single subject, and from the same dimension, it is possible for them to be in conflict with each other. It is possible that conflict in assertions and hypotheses stems from error in conceptual foundations, incorrect interpretation, inattention towards textual and contextual features, reliance on untrustworthy sources, selection of non-certain presuppositions, error in the arrangement of presuppositions, usage of inconclusive methods of ratiocination, illogical conclusions, inappropriate generalizations, and so on, examples of which are found more or less in all sciences. In the face of such differences of opinion and conflicts, one must proceed with the goal of reaching reality and the knowledge of the truth, while keeping away from biases alongside with the use of logical methods, bring them forth for critique and analysis, and thereby one must accepting the knowledge that has a stronger argument in its support and thus possesses a greater degree of confidence.

Each part of Islamic sciences and knowledge may be associated with a number of intellectual or empirical knowledge, and it is at these points of contact that sometimes apparent or real conflicts occur. Considering the types of religious and scientific propositions, the method of dealing with their conflicts becomes clear. There is a rule in epistemology that if something is proven (in any way) with certainty, it can no longer be refuted through another way. The result is that if things are conclusively proven by reason in the right way through the intellect, traditions and reasoning (related to a clear proof based on the reliable sources of tradition), sensory and empirical observation, or mystical intuition, they will never be in conflict with each other. In these cases, if there seems to be friction, it is a sign that one or all of that sources of knowledge are uncertain. Uncertainty can be due to the fact that one of these methods has not been used correctly, or has been used in a different way, or has accepted a result more than it is actually implied.

But if one of these knowledges is certain and the other is doubtful, certain knowledge should take precedence over doubtful one. If religious traditional knowledge and empirical scientific knowledge are both surmises, the credence of whichever is stronger, takes precedence over the other; and if both are assumed to be equal, neither can negate the other. Thus, one does not know which knowledge is correct. In such rare cases, one should refrain from judging until a new witness or reason is found in favor of one of the two parties .

4. What have been the grounds for the development of conflict between these two?

Perhaps it can be said that the humiliating, or rather the excommunicating view that the Christian Bible and the Church towards science has played a major role in shaping the Western world view regarding the relationship between science and religion and the belief in a definite conflict between the two. In their view, knowledge as a forbidden fruit has provoked the wrath of God, and caused man to be expelled from the Garden of Eden, his fall into the world for suffering and restoration, an affair that is clearly in conflict with religion, Divine will, and human felicity. For this reason, from the time that Roman emperors converted to Christianity and promoted the ideas of the Church as official opinions and beliefs, they set up opposition to free intellectuals and scientific spheres until finally Emperor Justinian of the Eastern Roman (Byzantine) empire in 529 AD ordered the closure of universities and the shutting down of schools in Athens and Alexandria. Then, scientists fled and took refuge in other cities and lands in fear for their lives. Thus, the glorious torch of science and philosophy in the realm of the Roman Empire was extinguished.

Another factor that institutionalized the conflict between science and religion in the mindset of modern Europeans is the irrational, anti-moral and unrealistic teachings attributed to Christianity as a religion. Such representation of a religion is clearly opposed to human intellect and nature, and its conflict with science and intellect is not far fetched for the mind.

The third factor that was added to the aforementioned factors came forth with the beginning of the Renaissance, which lit the spark of an intellectual and cultural revolution against religion in the modern era, which spread the domination of materialist and secular tendencies in the West. The emergence of ontological and epistemological theories, which revolved around materialism and sensationalism and was accompanied by dramatic advances in natural sciences, was able to create the illusion of epistemic self-sufficiency in Western man. Secularism was based on the premise that modern man does not need religion in his thought and action; rather, as Kant argued, man must free himself from the shackles of his artificial and voluntary dependence on religion and the Church fathers, and must stand on his own feet like an adult.[1] The combination of these factors went hand in hand to create the conditions under which the conflict between science and religion has become an obvious matter for Western thinkers today, and what remains is to find a solution to this conflict. Those who have commented on this issue have sometimes made conflicting proposals to resolve the conflict and to chart the theoretical and practical task for man.

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[1] Cf. Immanuel Kant, "An Answer to the Question: "What is Enlightenment?" Konigsberg in

Influenced by the atmosphere of debate between Christian theologians and Western scholars and philosophers, Muslim intellectuals sought similar debates in the Qur'an and traditions to discover their contradictions with empirical findings, and to provide new evidence for the validity of the theory of conflict between science and religion. Following such an illusion, some Muslim scholars have sought to find a solution for such conflicts, and have ultimately prescribed the same solutions proposed in the Christian world. The epistemological, methodological, and theological problems of these solutions have been discussed and critiqued in their place, and there is no place to address them here. What we are going to point out in this discussion are a few points that need to be explored in its place.

First, the word "religion" has different meanings in Islam and Christianity (and Judaism), and it is impossible to generalize the characteristics of one to another. Distortion in past religions is not only emphasized by the Holy Quran, Islamic traditions, and Muslim thinkers, but has also been accepted and acknowledged by many non-Muslim thinkers and scholars. However, the original text of the Holy Qur'an, which is the revelation of God to the Holy Prophet (peace be upon Him and His Progeny), is available today, and the reasons for its authenticity and validity are so clear and conclusive that it has forced even non-Muslims to confess it.

Secondly, in the world of experimental sciences, there are schools and theories that are compatible with religious principles, and it is not the case that science is completely in conflict with religion. Now, if these theories are not discussed in our schools and universities, it is a sign of the presence of directionality in the choice of books and theories for translation, teaching, and promotion. Furthermore, there is evidence for the presence of a deliberate attempt to project and establish an opposition and conflict between science and religion in the minds of school and university students.

The third point is that if our understanding of religious teachings is certain, differing empirical theories are certainly invalid and rejected, but when there

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Prussia, 30th September, 1784.

is a conflict between uncertain religious knowledge - the chain of narrations or textual implication of which is not definitive - the uncertain findings of the empirical sciences cannot be conclusively used to side with the truth of one and the falsity of the other. In non-obvious (theoretical) thoughts and opinions, there is a possibility of further research and different understandings and there is no escape from it.

The fourth point is that in epistemology and philosophy of science it has been explained in detail that the experimental method is unable to discover the exclusive causal relationship between sensory phenomena. For this reason, the findings of the experimental sciences are by no means certain and irrefutable, and the constant developments in scientific hypotheses and theories are evidence to this claim. In addition, due to its limitations, the scientific method is not able to study and discover intangible causes and their effects on material phenomena, and therefore it does not have the authority to definitively deny their effect. It can, therefore, be argued that none of the conflicting findings of the experimental sciences with religious teachings is like the conflict of two certain knowledges with each other, but that at least one side of the conflict, which is empirical knowledge, is always uncertain knowledge, wherein exists a possibility of error.

Sadly, scientific hypotheses are sometimes regarded as inviolable facts, and some go to religious teachings with the prejudice that anything other than new scientific findings is wrong and should be rejected or, at best, interpreted. In such cases, one imposes an unrealistic and unconventional meaning on religious texts under the notion of modern thinking, perception, and new understanding. This causes misunderstanding of religion; a religion that is the plan of life and the roadmap to eternal felicity, and any mistake in understanding it may lead to eternal ruin. Therefore, we must be careful not to interpret religious texts under the influence of such mental prejudices, and not to abandon religious certainties due to some uncertain empirical hypotheses and theories. Even by relying on some empirical scientific theories, one should not easily give up the apparent literal meanings of Qur'ānic verses and turn to metaphorical ones.

5.What has been the role of religion in the development of science in the Islamic civilization and in the West?

The great Prophet of Islam, in the first step after the onset of Revelation, invited the people to learn knowledge, and considered the highest honour and dignity for reading, writing, and learning, and laid the foundation of the greatest of civilizations and the loftiest cultures in the world. Islam has encouraged its followers to learn knowledge and wisdom from the beginning to the end of their life (from the cradle to the grave) and from the nearest to the farthest parts of the world (even if knowledge is in China) and at any cost (even with the loss of blood and diving to the depths).

The valuable saplings of Islamic culture, which were planted by the able hands of the Messenger of God (S) grew and became stout in the light of the life-giving rays of Divine revelation and the nourishment by the food of other cultures, by absorbing the raw materials for human thought which possessed the correct Divine standards, and eventually turning them into useful elements in the furnace of constructive criticism, and in a short time spread over all cultures of the world.

In the shadow of the encouragement of the Holy Prophet (S) and his Infallible successors, Muslims studied various sciences and translated the scientific heritage of Greece, Rome and Iran into Arabic, and absorbed their useful elements and supplemented them with their own research, and in many disciplines such as algebra, trigonometry, physics, landscapes, physics and chemistry accomplished various discoveries and inventions. With the expansion of the Islamic government and the inclination of various ethnic groups towards this life-giving religion, many scientific centers of the world fell within the Islamic lands and facilitated the exchange of information between scholars and the exchange of books between libraries and their translation from various languages like Indian, Persian, Greek, Latin, Syriac, Hebrew And so on, into Arabic, which had become practically the international language of the Muslims, thereby accelerated the growth of philosophy, science and technology. It was this science that was later translated into European languages, and shone the light of science into the darkness of the Middle Ages, and became the basis of Western scientific progress.

6. Can we have a religious science?

To answer this question, one must consider the given definitions of "science" and "religion". Similarly, the criteria and occasions that lead to a religious description being attributed to science should also be examined. First of all, it is necessary to mention that the only science that can be attributed to religion (and non-religion) is that which has something in common with religion. In this case, if it is compatible with religion in its common aspects, it will be termed "religious", otherwise it will be considered "secular". A science that has nothing in common with religion in its subject, purpose, foundations, method, etc., cannot be considered to being religious (or non-religious). For example, if religion is meant to mean "a set of beliefs and values directed at human well-being," it cannot have a direct effect on science, i.e. "empirical knowledge of tangible phenomena," because belief or disbelief in God and other religious teachings have no bearing on the discovery of the relationship between two tangible phenomena through experience. Of course, the result of these discoveries can be used as a premise in rational reasoning, and produces theological and philosophical results, which is another discussion and is not part of the problems of the experimental sciences.

But science, according to our chosen definition given above, in addition to not being limited to a particular method, is also divided into descriptive and prescriptive (or instructive); and this vastness of the realm of science causes different branches of science to have different relations with different parts of religion (according to the selected definition). In other words, "descriptive sciences" are responsible for recognizing phenomena and explaining the relationships between phenomena. For example, the study of bodies and the study of the amount and type of elements that make up a particular substance, and the expression of its physical and chemical properties and the causal relationships between them are among the goals of some natural sciences. But research into the possible, permissible, and useful uses of different materials in everyday life goes beyond the scope and purpose of these descriptive sciences, because it relates to human behavior, which falls within the realm of "instructive sciences." Instructive sciences are based on the prerequisites and principles of anthropological and axiological subjects that must be discovered and proven in other fundamental rational or narrative sciences. Recognizing the ultimate goal of life and intermediary goals, and discovering the relationship between human behaviour and desirable goals are among these issues. It is only on the basis of such basic knowledge that the instructive and applied sciences will be able to express how to deal with material phenomena, and how to use them properly in the form of advice and instructions.

On the other hand, religion, in turn, has the mission of expressing the facts related to human felicity, explaining the relationship between phenomena and true perfection and human interests, expressing how to achieve true human felicity, and issuing appropriate orders and rulings. To this end, religion evaluates the way man interacts with all material and immaterial phenomena, and determines man's duty in dealing with them. In this way, common areas emerge between descriptive and instructive sciences and religion. If the findings of science are consistent with religious teachings, we shall have instances of religious science.

The situation is similar in the humanities. As far as the description of human reality, the nature of a human or social phenomenon, and the explanation of its relation to other phenomena is concerned, we are dealing with purely descriptive sciences. These sciences, which must merely describe, explain, or interpret human and social realities, are shared between religious and non-religious, Muslims and non-Muslims alike. Of course, there is no limit to the methods used in the discovery of these facts in the descriptive sciences, and these sciences may use experience, reason, intuition, or narration, while authentic religious texts can serve as a reliable source for those who believe that religion can discover these facts, especially facts related to human felicity. If these descriptions (of the human nature) are consistent with Islamic foundations, methods, and goals, they can be called religious science.

It is necessary to reiterate that this point certainly does not mean that every theory expressed by anyone is true and must be accepted by all, but as we have already noted, the views and theories that are put forward in various sciences are possibly true or false, and the criterion for accepting or rejecting them is merely valid logical and epistemological principles.

When researchers go beyond description and step foot into the realm of evaluation, standardization, and recommending guidelines on economic, legal, educational matters and the like, they enter the realm of "instructive sciences," which share broader boundaries with religion.

For example, in economic discussions, merely studying and explaining the mechanisms governing the market is a part of (descriptive) economics, the expression of which is not originally considered as one of the duties of religion. Hence, the discovery and analysis of these relationships is often not religious or secular. But when it comes to the quantity and quality of production, choice of the type of commodity, purpose of production, pricing, competition, sale and the like, values are involved in determining these issues that interfere with the purpose of religion. Thus, the beliefs, morals, and practical precepts of religion can influence the principles of the subject, the answers, and the economic guidelines. It is in such matters that the difference between religious and non-religious science becomes quite apparent. Accordingly, religious (Islamic) economics is a science that considers and conforms to, or at least does not contradict, the ideological and axiological foundations of religion at different levels of this science. The necessity of this conformity and non-contradiction is not merely a devotional obligation, but itself is based on principles which have been proven in their place by rational argument, and are therefore accepted and emphasized by us.

In contrast, scientific theories (descriptive or instructive) that are either based on anti-religious principles such as materialism, denial of the immaterial, and denial of the soul independent of the body, or suggest methods and behaviors that are inconsistent with or contradict religious beliefs or values are examples of science considered non-religious or anti-religious. By conflict with religion, here we mean that these theories are based on pre-conceived core principles, such as confining existence with matter or limiting human to in this world, which are not accepted by religion. The islamization of these sciences requires that discovery, explanation and interpretation of phenomena, and prescription of methods and behaviors are consistent with Islamic beliefs and values.

7. Can science dispense with religion?

As is clear from the answer to the previous question, each of science and religion (in our selected definition) can have specific and common domains. Some purely descriptive sciences have no direct connection with religion, and therefore act independently to discover relevant facts and solve their own problems, although in the preliminaries of scientific studies such as choice of subject, method, and purpose are influenced by para-scientific (including religious) beliefs and values. are. Likewise, in the way of applying the results of their research, they enter the field of instructive sciences, which is closely related to the realm of religion.

But instructive sciences (or prescriptive sciences) that appraise behaviors and individual and social actions to achieve a specific goal, have the most commonalities with religion. They need the guidance of the true religion, both in recognizing the valuable purpose of human life and in identifying the right ways to achieve it. It is important to note that this fact should not lead to the popular perception that one should seek a special and ready prescriptive copy of the Qur'an and Hadith for any individual or social problem. Thus, what is sometimes referred to as the Maximalism in religion refers to the hypothesis that all knowledge of existence, its quiddity, its purpose, and possible general and specific values should be extracted from the words and phrases of the Book and Sunnah. This is an imaginary matter and is not compatible with the teachings and claims of the religion of Islam.

Articulating the value of human behaviors in terms of their impact on human felicity or ruin is within the scope of the duties of religion, and this fact explains the true meaning of the comprehensiveness of religion. This is because first of all, from the Islamic perspective, God rules over the world and human beings and determines human responsibility which is within the scope of His Authority. Secondly, Islam draws a continuum between the life of this world and the life of the Hereafter, according to which the effects of human behaviors and actions on his well-being or ill-being in his future life in this world and also on his progression or regression in the Hereafter. It is because of the effect of human voluntary behaviors in ultimate perfection and eternal bliss that these human behaviors take on an axiological color, and from this perspective they enter the realm of religion.

A complete religion must be comprehensive from this point of view, and failure to address these issues is a shortcoming for religion. In short, beyond the worldly consequences of behaviors, religion views the aspect of the consequences of behaviors that leads to eternal bliss or misery. As religion covers all individual and social issues of man, it includes the human relation with God, the human relation with other human beings in all areas such as social, educational, administrative, economic, legal, political and international affairs, the human relation with nature and the environment, and thereby judges the values and do's and don'ts related to them.

8. Can one separate the domains of activity of science and religion completely?

From the Islamic point of view, all voluntary actions of man can be effective in his eternal felicity or misery, and therefore expressing their relationship with the eternal destiny of man is within the scope of duties and realm of religion. In this approach, the realm of religion includes all matters of human life, including individual, social, material, spiritual, worldly and otherworldly issues, and all these issues are viewed under the realm of religion with a special lens. The inclusion of religion in such matters is conditional to their intended purpose. If the relationship between knowledge and action is taken into account vis-à-vis human felicity and perfection, we have entered the realm of religion, whether these issues are related to worldly affairs or directly exploring the Hereafter, or are involved in describing facts, or promoting or prohibiting specific actions.

The claim that all aspects of human life fall within the realm of religion has one premise and two preconditions. The premise of this claim is that all voluntary human actions play a role in the ultimate human felicity and misery. The first precondition of this statement is that the role of affairs and actions in the eternal felicity of man should be considered; and the second precondition is that these matters be voluntary, since as explained in the discussions of the philosophy of ethics and values, involuntary matters and actions by themselves have no role in eternal felicity or misery.

Thus, what enters into the realm of religion (in this sense) is the facet of individual and social issues that are related to the goal of human creation and his felicity (and misery). In other words, appraising the value of human actions in terms of their impact on human felicity or misery is within the scope of the duties of religion, not all realities or all human facets and issues related to the human and his actions. From this perspective, expression of facts related to realities in physics or chemistry, geology and cosmology, the structure of the human body (anatomy/physiology), bodily disease and health, psychological detriment and material factors affecting their treatment, and thousands of other issues of this kind, as long as their relationship with the ultimate felicity of man is not taken into account, they are not considered as religious issues, and their expression is not considered as one of the duties of religion. Understanding phenomena and discovering the relationships between material truths are not directly related to values and felicity or misery, but it is the way they are used in human life and how we interact with them that brings us into the realm of voluntary actions and values and thus into the realm of religion.

Matters that end up within the realm of religion in this sense include a wide range of individual and social, devotional and interactive issues (transactions in the general sense). This is why Islam, unlike some distorted religions, has not limited itself to individual issues and inner feelings, but has devoted a large part of its teachings and instructions to social affairs and human relations with each other and their interaction with the world around them. This fact stems from the fact that from the Islamic point of view, all voluntary human behaviors can affect his eternal felicity or misery, and therefore the expression of their relationship with the eternal destiny of man is in the realm of the duties and realm of religion.

Therefore, religion, as a roadmap to the attainment of ultimate perfection and a plan for a felicitous life, has no original obligation to explain external and objective truths, except to state the truths which are necessary for human well-being; which can be divided into two categories: a) theoretical truths such that human felicity or misery is tied to accepting or rejecting them, and b) practical truths that lead to felicity. A complete religion must be comprehensive from this point of view, and failure to address these issues is a defect for religion. Failure to state facts that fall outside this framework is outside the realm of religion. Of course, if such matters (for whatever reason) are mentioned in authentic religious sources, they are valid, although if they were not stated in religious sources, it would not be considered a shortcoming in religion.

Prof. Jamal Mimouni

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Postgraduate Experience: Assistant Professor of Physics, Constantine University, 1985; Professor of Physics, Constantine University, 2002.

Current areas of Research: Neutrino astrophysics, particle phenomenology. Epistemology of science; the linguistic problems related to science teaching in an Arabic speaking context.

Publications: Various articles in theoretical physics; a number of articles on the interface between science and society, and science and Islam. A book written with N. Guessoum for the educated layman: *The Story of the Universe: from Early Conceptions to the Big Bang.*

1. What is your definition of science and of religion?

Science is a magnificent human adventure attempting at deciphering the natural world and making use of the knowledge gained in the process for the benefit of mankind. It is also an adventure in the sense that the expanded knowledge acquired crosses frontier after frontier without obvious end, opening up many discovery trails for the scientists engaged in it. Let us bring forth this quote from R. Feynman with patent mystical overtones[1]:

> *With more knowledge comes deeper, more wonderful mystery.... Never concerned that the answer may prove disappointing, but with pleasure and confidence, we turn over each new stone to find unimagined strangeness leading on to more wonderful questions and mysteries, certainly a grand adventure.*

It is an adventure for which even the rules of the game are changing with time as new paradigms appear, new methodologies emerge, and even the meaning of what is meant by objectivity evolves! Let us recall as an example, how in the microscopic world, we witnessed an escalade of abstruseness: we have accepted that atoms exist although they couldn't be detected directly, then that elementary particles like protons and electrons couldn't be fully determined dynamically due to the quantum limitations, then that the constituents of ordinary matter – the quarks – couldn't be isolated even in principle. Methodologically, we also went from pure empiricism where experimental data must come before theorizing, to the hypothetico-deductive method, to new epistemological stances especially in theoretical physics and cosmology. This ever shifting methodology of science is made necessary in order to face the new challenges of the microscopic, macroscopic and living worlds. Science is thus a human activity through and through, which is made possible in the first place by the incredible God given capabilities that characterize the human mind.

Religion, on the other hand, is a divine guidance given to man by He Who created him in the first place. It is thus, in contradistinction with science, immutable. Although man feels intuitively (by "fitra"), the existence of a Higher Presence, he lacks the capability to find by himself his reason of being and purpose in life; thus comes the role of the Revelation through Prophets of "our own stock", to answer such metaphysical questionings. The basic purpose of our existence and duties on Earth in the Islamic perspective are perhaps best summarized in this Qur'anic verse (28:77):

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[1] Engineering and Science, Vol. XIX, 1955, *The value of science*, R. Feynman.

> *Seek by means of what God has granted to you the Last Abode, but do not forget your rightful share of this world, and do good unto others as God has been good to you, and seek not to spread corruption on earth, for verily God does not love the spreaders of evil.*

2. Do you see any conflict between your definitions of these two concepts?

There is no contradiction between them.

3. Where do you think there may be a conflict between these two?

Conflict could indeed occur as each domain may attempt to appropriate to itself a portion of the other's domain. This has indeed happened historically, especially in Europe, during the past few centuries, and lead to a relentless warfare and much misunderstanding.

Conflicts could occur when:

– Scriptures are taken literally when it shouldn't, leading to a contest game on a ground (the material world) which is not its own.

– Science attempts an OPA on all the knowledge[1], which brings a legitimate backlash from other sectors including religion. This may be called the scientist temptation.

Yet, conflict could be unavoidable since there is some epistemic overlap between both, which at times leads to conflict-provoking situations. Let me discuss two extreme stands which I believe are unworthy:

– Asking science to merely take data, theorize using mathematical models, and not draw any general conclusion about the material world like some religious thinkers attempt to do, is senseless. Generalizing, making connections between things, synthesizing, is indeed the bread and butter of science.

– Refusing that knowledge attained by science be used towards a better spiritual understanding of the world, a better appreciation of God's wondrous creation, or even a better comprehension of some specific religious injunctions, like some scientists insist upon, is blindness.

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[1] E. Renan, the well-known French orientalist and rationalist put it squarely: "Science is the only legitimate way of knowing".

4.What have been the grounds for the development of conflict between these two?

Science did develop in Europe during the Renaissance till today, with the uninterrupted success that we know. Although it is not known exactly what are the right set of determining factors, yet the following ones seem to be essential:

– Science becoming an autonomous intellectual activity, made possible in a large part by the rise of self-sustained scholarly institutions, the Universities!

– Scientific pursuit being seen by the society at large as a respected and praise worthy endeavor, meriting financial support and moral recognition.

– Science's usefulness in industry (and today in daily life too) leading to an economical plus-value, which made science invaluable as well as catalyzed its development.

It is this autonomy of science as well as it taking up large portions of what used to be religion's ground, which lead to conflicts. Misunderstanding and suspicion then had its day…

5.What has been the role of religion in the development of science in the West?

The notion of an ordered world created by God, present in the Judeo-Christian world, had certainly an important heuristic role in the development of science. On the other hand, the confrontation between the Church's authority and the scientists in the 17th century has enabled a decantation to take place and science to become an independent project freed from direct ideological meddling. Modern science could then emerge.

The other side of the coin is that this separation has made science free of any ethical concern as a whole, leaving the problem of conscience to the individual scientists. This missing moral dimension has led to the worse man-made catastrophes of last century (human, ecological…)[1]. Thus, as an example, the Manhattan project could proceed, whose objective was indiscriminate mass killing, with many of the scientists involved in it not even aware of the evil weapon they were participating in the fabrication.

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[1] "*In the Western perspective, the means have become the ends: science and technology are no more in the service of Man. On the contrary, Man and his environment are subordinated to the autonomous and devouring development of science and technology.*" (Roger Garaudy, Promesses de l'Islam, p. 92, Edition du Seuil, Paris, 1981).

6. Can we have a religious science?

A religious science understood as a science of the material world based on religion is quite contradictory and a parody which could only end up in confusion.

Religious science could be understood in a sense where some broad religious principles of ethical kind like the respect of nature, altruism, intellectual honesty, are inplemented; but it is a rather trivial meaning of the expression.

On the other hand, science being value-laden, if developed in a religious community, even if it is practiced in a strict empirical way, should somehow bear the marks of the values of that community. But as science is now a worldwide multicultural enterprise, that religious community's science would not likely leave any conspicuous imprint on the science in the making, except if those scientists are in a leadership situation worldwide. Even then, to disentangle the ideological influence coming from their faith from the more mundane ones is problematic and most likely hopeless. However, the matter could be quite different in the realm of applied science and technology, since ethical choices must constantly and rather explicitly be made.

7. Can science dispense with religion?

Yes in the technical sense of the term, as it is obvious that the religious inclination of the scientist doesn't enter in any palpable way into the science production and validation process.

Yet, in a wider perspective, the success of the scientific endeavor is built upon the assumptions of regularity and comprehensibility of the world...

8. Can one separate the domains of activity of science and religion completely?

Islamically speaking, doing science (as doing any other kind of lawful activity as a matter of fact) is considered as one facet of worship. Furthermore, doing so, scientists are just answering the numerous Qur'anic invitations to investigate God's patterns and marvels in His creation. It is also an enterprise whose fruits, if used wisely, should lead to the betterment of mankind.

In terms of methodology, the separation is desirable. Yet, education of the aspiring scientists should be conceived so that they get a healthy dose of ethical education so as not to make out of them Faustian characters.

Dr. George L. Murphy

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Education: B.S. in Physics (1963), Ohio University; Ph.D. in Physics (1972), John Hopkins University; M. Div. (1983), Wartburg Theological Seminary.

Post-graduate Experience: Instructor and Assistant Prof. of Physics (1968-75), Westminster College, PA; Lecturer in Physics (1975-77), University of Western Australia; Assistant Prof. of Physics (1977-79,80,83), Luther College; Pastor, St. Mark Lutheran Church, Tallmadge, OH (1984-1999); Pastoral Associate, St. Paul's Episcopal Church, Akron, OH (since 1999); Instructor, Trinity Lutheran Seminary, Columbus, OH (since 1994).

Awards: Templeton Award for Science & Religion Course Development (1995).

Publications: 28 articles in Theoretical Physics and 80 in Science and Theology; Four books: *The Trademark of God* (1988); *Cosmic Witness* (1996); *Toward a Christian View of a Scientific World* (2001) ; *The Cosmos in the Light of the Cross* (2004).

1. What is your definition of science and of religion?

Religion deals with ultimate reality, the "Ground of Being", or "God". Science deals in principle with the rest of reality, which is dependent upon God. (In practice, we are far from a "scientific" understanding of much of the universe). This reality which is not identical with God is the "universe". Religion is true to the extent that it acknowledges and speaks correctly of what really is ultimate reality, and false to the extent that it mistakes something else (real or imaginary) for this ultimate reality.

These definitions focus on the respective contents of religion and of science rather than on their methodologies. The word "science" is used differently if one speaks, for example, of theology as a science. Religion, as a human phenomenon, can be studied scientifically.

2. Do you see any conflict between your definitions of these two concepts?

I see no conflict in the definitions themselves, but that reflects my own religious beliefs to some extent. For atheists, religion in this sense would be empty because they believe there is no reality different from the world. Pantheists would object to these definitions because they wish to identify God with the universe. They might consider science and religion in the senses used here to be virtually the same.

3. Where do you think there may be a conflict between these two?

At an elementary level, conflicts arise because some religions have identified aspects of the world with ultimate reality. If one believes that storms are caused directly by a storm god, then attempts to develop scientific meteorology can easily result in conflicts with that belief system.

At a more sophisticated level, there will be tensions, though not necessarily conflicts, if one believes, as most religions do, that God interacts in one way or another with the universe. If this is the case, religion and science will both speak about phenomena in which this interaction takes place. They will see these phenomena from different viewpoints and will not necessarily disagree about them. However, there may be differences of opinion even between people who share the same fundamental beliefs about which aspects of the phenomena should be considered "scientific" and which should be considered "religious" – or perhaps whether that distinction can even be made.

4. What have been the grounds for the development of conflict between these two?

The points noted under (3) are important here, but there are other considerations as well. Religious believers do not always recognize that sacred texts can be true in ways which differ from the truth of scientific accounts. Poetry, for example, may not provide an accurate scientific or historical account of what has happened, but may be able to convey the meaning of what has happened more fully than would a detailed and historically accurate account.

People have also not always made the necessary distinction between the model of the world which people in a given culture have and the religious truths which are conveyed in the language of that model. For example, the writers of the first chapters of Genesis used models of the world thought to be accurate in the Middle East some 3,000 years ago in order to speak of God as the creator of the world. But the basic message of those texts is that God is the creator of the world, in whatever way that world is described scientifically.

5. What has been the role of religion in the development of science in the West?

This is a complicated issue about which historians of science differ. But I think it can be said that the development of science was helped by aspects of the biblical doctrine of creation. The world as creation was understood to be something different from God. This meant that it was not sacrilege to analyze the world. The world as creation was believed good, and therefore worthy of study. Especially with the support of the philosophical tradition inherited from Greece, this goodness of the world included its rationality. This meant that rational scientific processes could understand it, at least approximately.

6. Can we have a religious science?

My answers to the next two questions must really be considered together.

There certainly can be "religious science" in the sense that scientists hold sincere religious beliefs and respect the beliefs of others. Nothing in legitimate science requires a person to reject religious beliefs, though specific claims of some religious bodies may be contradicted by scientific findings.

Religiously based ethics can help to guide scientists in the conduct of their work, insisting, for example, that such work be done honestly and that the welfare of others be considered in developing new science-based technologies. The scientist who is a religious believer may also see his or her work as disclosing God's creative activity, and thus regard it in a sense as an act of worship. Such beliefs may inspire the scientist in his or her research.

But if "religious science" is taken to mean a science which claims to receive scientific information about the world from divine revelation or religious traditions, there are serious problems with the concept. Religion does speak of God's interaction with the natural processes of the world, but does not provide detailed scientific explanations of those processes. Religion may picture God as creating and making use of natural processes as "instruments". Science describes how those instruments work, but it does not tell us who is using them.

7. Can science dispense with religion?

In an important sense, yes. That can be accepted simply as an empirical statement. Many people who are atheists or agnostics, as well as those from a variety of religious traditions, do good scientific work. Even people who are seriously committed to one faith or another need make no reference to their religious beliefs in connection with their scientific work.

Of course, atheists would say that this is not surprising, and argue that science not only can but also should dispense with religion. But one can also make the case for a positive answer to this question from a religious standpoint. If God has created a universe with rational creatures who are able to understand their world through scientific study, then God chooses to operate in the universe in such a way that the things which take place are describable by rational laws. Intelligent beings are then able to understand these laws (at least approximately) and the processes which they describe, and need go no further to ask about other aspects of reality.

However, scientists exceed their own domain of competence if they then argue that there is no reality beyond that which science can discern. Science can dispense with religion but cannot maintain that religion is empty or that science can provide a legitimate substitute for religion.

8. Can one separate the domains of activity of science and religion completely?

As noted above, most religions believe that God interacts with the universe in various ways. Phenomena in which a religion believes such interaction to take place (and for some religions these will include everything that happens in the universe) are appropriately treated by both science and religion. However, they consider different aspects of the phenomena, so care is needed in discussing the relationships between scientific and religious descriptions.

Dr. Anwar Nasim

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Post-Doctoral Professional Experience: Adjunct Professor (1983-1989), Dept. of Microbiology and Immunology, Univ. of Ottawa; Adjunct Professor (1984-1989), Dept of Biology, Carleton University, Ottawa; Consultant and Member of Int'l Advisory Committee for National Institute for Biotechnology and Genetic Engineering, Faisalabad (1993 to present); Honorary Professor in H.E.J. Research Institute of Chemistry, University of Karachi; Member Board of the Higher Education Commission, Islamabad; Member BOG of Foundation University, Islamabad; Member of Academic Council of the Government College University, Lahore; Member of Thames Business School Advisory Council, Islamabad; Member of Research Advisory Committee of Pakistan Agricultural Research Council, Islamabad; International Coordinator for the XVI International Congress of Genetics, Toronto, Canada, 1988; Chairman of the Advisory Committee Urdu Science Board, Lahore; Chairman of National Commission on Biotechnology, Pakistan; Chairman of Pakistan Chapter of Third World Academy of Sciences; Elected Fellow of Third World Academy of Sciences, 1987; Elected Foreign Fellow of the Pakistan Academy of Sciences, 1988; Elected Fellow of Islamic Academy of Sciences, 1998; Elected Fellow of Pakistan Academy of Medical Sciences, 2000; Science Advisor, COMSTECH Secretariat, Islamabad, Pakistan.

Publications: More than 100 scientific papers published in prestigious international Journals; Edited 6 books on Biotechnology.

Awards: Pride of Performance, Civil Award in Molecular Genetics, 1995; Sitara-Imtiaz, Civil Award in Molecular Genetics, 1999; Overseas Pakistani's Institute (OPI) Award for outstanding services for promotion of science in Pakistan, 1995; Gold Medal in M.Sc.

1. What is your definition of science and of religion?

Science is a global search for reality. Science satisfies human thirst for knowledge. Science studies nature and reveals the truth about mysteries of nature. Science, in the broader sense, can be defined as an investigation of a theory leading to concrete conclusions and results through observation and step by step experimentation. Thus, Science helps test hypothesis and theories using scientific methods revealing facts. Science has been very useful in enhancing human knowledge of nature, opening up new areas of knowledge, leading to technology and enhancing the quality of life of people generally. However, to acquire complete knowledge of the universe is virtually impossible. Hence, scientists must always remain conscious of this limitation and set limits to what is scientifically achievable.

Religion is much broader than science. Here, my opinions and ideas will be generally under the context of Islam. Islam is a Complete way of life, governed by a set of principles. It is something spiritual, a belief in life after death, a source of guidance, stressing human values and virtues, such as faith, honesty, discipline, truthfulness, generosity, kindness, respect, consciousness, etc., shaping up people's lives. It is a belief that affects the thinking of people, thereby affecting their behaviour and actions and way of life, quite strongly. It has a direct bearing on the morals and ethics of the individuals. Religion has a role in society and governs it as a whole. In addition, religion also encourages that knowledge be sought and research be carried out.

2. Do you see any conflict between your definitions of these two concepts?

None whatsoever. Religion, particularly Islam, asks us to study, to do research and try to understand the mysteries of nature. This is only possible by integrating science with religion and nature. Since in my opinion science & religion are two separate activities, there is no conflict between the two. It is just that religion encompasses many more things and scientific pursuit is only one such activity.

3. Where do you think there may be a conflict between these two?

There can never be a conflict between true science and true religion, because they both describe reality. Science and religion have mostly run hand in hand with each other. In fact, people's belief in religion, particularly Islam, strengthens when science reveals the mysteries of nature and people also think that to pursue scientific activity is like being involved in a religious activity; in a way it is a call to fulfill a human commitment.

4. What have been the grounds for the development of conflict between these two?

A conflict may arise under extreme conditions, such as wrong interpretation of the religion by a group of fundamentalists, who have ambivalent attitude towards science, progress and knowledge. These extremist groups think that science is a threat to the planet and that it disturbs the natural balance in ecosystem. These religious leaders sometimes try to dictate their ideas to all those who are on the path to scientific pursuits. Similarly, conflicts may also appear when scientists try to cross the boundaries and play God, by undertaking the kind of research which is against nature, e.g., by trying to indulge in the creation of life through human cloning and in ending life through euthanasia. Thus any conflicts that occur are not due to science and religion themselves but because of human intervention and activity, which transcends the limits on either side.

5. What has been the role of religion in the development of science in the West?

Although it is true that science has progressed a lot in the west during the past few centuries, the basics were acquired by them from the Muslims who had earlier done a lot in the fields of medicine, chemistry, astronomy & astrology. The scientific legacy of the Muslim scientists was the driving force behind the Western modern science. The roots of Western scientific and intellectual development can be traced to the Arab science that influenced the world till the 14th century.

Later on, during the Renaissance, Christianity organized and established itself on modern lines; it supported science. However, there are examples of church being in conflict with certain discoveries, as we see in the case of Galileo, who was put to trial by the Roman Catholic Church in the 1600's, as the Church did not agree with Galileo's idea of the solar system.

6. Can we have a religious science?

None in the literal sense of the word. I think as Muslims we believe that science is compatible with religion. As I have mentioned above, science is a global activity. I do not believe in any such thing as "Islamic Science" or for that matter "Christian Science and Jewish Science". However, our belief in one God and his set of principles about the universe and people as well as the stress on acquiring knowledge in our religion drives and motivates us to undertake in-depth research and study within the framework of moral and ethical values governed by Islam. Muslims will continue to seek guidance from the Holy Qur'an and the Hadith for scientific research, as well as for their behaviour and actions.

7. Can Science dispense with religion?

No. True science has its roots in religion, particularly Islam. Our religion through the Holy Qur'an gives us some indications about the hidden mysteries of universe, medicine as well as human beings and asks Muslims to undertake in-depth research and to investigate thoroughly these mysteries. This is exactly what science has been doing. Open-mindedness demands that science and religion should work together and only then we shall be able to dig deep and find out the answer to the myths and mysteries. Events in history have clearly shown that whenever science dispensed with religion and entered into unethical acts, it led to destruction, loss of human life and harm to society.

8. Can one separate the domains of activity of science and religion completely?

Certainly not. Although some domains of activity of science are different from that of religion, yet in this modern world, it is well recognized that science & religion cannot be separated. Religion is all about the different dimensions of this universe and the rules that govern our existence. Both science and religion work for improving the human condition. The fact that recent findings resulting from scientific research have been seen to be consistent with the contents of the Holy Qur'an, which was revealed fourteen centuries ago, is simply a source of further additional strengthening of our belief in the sound rational basis of Islam.

Prof. Seyyed Hossein Nasr

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Education: B.S. in Physics (1954), MIT; M.S. and Ph.D. on Islamic Science (1958), Harvard University.

Post-graduate Experiences: Associate Professor at Tehran University (1958); Professor at Harvard University, Tehran University, American University of Beirut, Princeton University, University of Utah, Temple University, and Presently University Professor of Islamic Studies at the George Washington University; Dean, later Vice Chancellor of Tehran University; Chancellor at Sharif University of Technology (Formerly called Arya-Mehr University); Founder and First President of the Iranian Academy of Philosophy.

Publications: More than 400 publications in English, Persian, French and Arabic on Islamic Philosophy, Mysticism and Science and the Environmental Crisis, including the following books: *Three Muslim Sages* (1964); *Science and Civilization in Islam* (1968); *Introduction to Islamic Cosmological Doctrines* (1978); *Knowledge and the Sacred* (1981); *Traditional Islam in the Modern World* (1987); *The Need for a Sacred Science* (1993); *Religion and The Order of Nature* (1996); *The Heart of Islam* (2004); *Islam-Religion, History and Civilization* (2002); *Philosophy ih the Land of Prophecy.*

1. What is your definition of science and of religion?

Since in answering these queries I have been asked to limit the meaning of the term science to the experimental (and I presume the mathematical without which experimental sciences as understood today would not be possible), I shall limit my definition here to modern science, that is, the science which developed in the 16th and 17th centuries in Western Europe on the basis of Islamic and Greek science, but with a very different understanding of the nature of physical reality, epistemology and the relation between the cosmos and the Divine Principle than what one finds in the traditional sciences of nature such as the Islamic.

As for religion, I understand by it revelations of Divine Origin that have led to established traditions which over the millennia have governed the life of various segments of humanity. This definition therefore excludes general religious sentiment, recently established "religions" or modernized interpretations of religion resulting from the even greater secularizations of the cosmos, life and thought particularly in the modern West. My comments therefore refer to religion as traditionally understood.

2. Do you see any conflict between your definitions of these two concepts?

I see a definite conflict not only between my definitions but most of all between the two realities to which these concepts correspond, between the cosmic view of religion and of science as defined above and given exclusive right over nature as a result of which all knowledge of nature becomes limited to the scientific as is the case in the modern world.

3. Where do you think there may be a conflict between these two?

If science is accepted as a particular form of knowledge of an aspect of physical reality, then there would be no conflict in principle, but as soon as science is considered as the only legitimate knowledge of the world and what is worse all knowledge that is not scientific is either rejected or is relegated to the realm of poetry, sentiment, imagination, subjectivism and the like, then conflict is to be found with the religious view of reality in numerous domains, some of the most important of which are as follows:

a) From the religious point of view the origin of the universe is the Divine

Principle, the God of the Abrahamic religions, who transcends the domain of change and becoming. For science, such a belief is irrelevant; that is why some scientists are theists, others monists, others agnostics and yet others atheists. These religious positions are irrelevant to their science.

b) For religion, all authentic knowledge has its roots in the Divine Intellect and must ultimately lead to or be related to the Divine Principle whereas modern science seeks to explain the working of the whole universe without recourse to the Divine Principle. Religion has access to revelation and intellection as well as to reason, and science to only reason and sensual knowledge arrived at empirically. Religious epistemology is different from scientific epistemology and under no condition can be reduced to it.

c) According to the Abrahamic religions as well as Hinduism and Zoroastrianism and the Shamanic and archaic religions (although some are silent on the question of cosmogony), the world has an origin and an end both of which transcend the temporal sequence of events. Although modern cosmologists speak of the birth and death of the universe, these are always considered in purely naturalistic and "materialistic" terms, a view which differs completely from the perspective of traditional cosmologies for which the coming forth and absorption of the cosmos are both in relation to higher orders of reality.

d) All traditional metaphysics and religious views of the cosmos are based on the hierarchy of being. The physical world is the lowest level of reality above which stand the various levels of the psychic and spiritual worlds leading finally to the Divine Realm. Modern thought, as a result of the impact of modern science, has caused these levels to be reduced to a single psycho-physical realm bringing about a reductionism which characterizes, if not the thought of great scientists themselves, then the general public's understanding of science. These days in Western culture, to understand anything is equated with reducing it to its material basis. While God is denied or made irrelevant to the scientific enterprise, the spirit is reduced to the psyche, the psyche to biological functions, biological functions to chemical ones, and chemistry to physics. While for religions existence itself and all values descent from above, from the Source of all reality, in the prevalent scientific worldview an attempt is made to derive everything from below, from the original soup of molecules through that magical process called evolution as a result of which the greatest prophets and saints are simply the result of chance mutations and evolution of atoms and molecules which without any design but by pure accident have resulted in the paragons of human perfection.

e) For religions, what appears as "laws of nature" are reflections of Divine Wisdom and in the Abrahamic monotheisms also the Divine Will. Moreover, the cosmos is not only created by God, but is sustained by Him at every moment. His creative power makes possible the existence of the cosmos here and now and at every moment of cosmic history and His Will as well as powers and beings in higher realms of existence such as the angels, to use Qur'anic language, penetrate into and are active in the cosmos. This view is totally against determinism from below, that is, a quantitative determinism, which governs the scientific point of view on the macro-scale whatever interpretation might be given to quantum mechanical probabilities.

f) In all religions, the laws which govern the cosmos are related to ethical laws as well as religion which should govern human actions. Words such as *tao*, *rta*, *sunnat-Allāh*, and *nomos* (*nāmūs*) in the Far Eastern religions, Hinduism, Buddhism and Islam as well as traditional philosophy all point to the same reality. They all mean both "laws of nature" and principles of ethical human action. In total contrast, "laws of nature" as conceived by modern science have nothing whatsoever to do with ethics although many scientists are personally highly ethical people.

g) For modern science, "facts" of nature are phenomena to be studied either mathematically or descriptively in themselves. They do not refer to a higher order of reality. For religion, phenomena of nature are symbols, the "signs of God" (*ayāt Allāh*, *vestigia Dei*), symbols of a higher order of reality and gateway to that order.

4.What have been the grounds for the development of conflict between these two?

All the points mentioned above are grounds for conflict, but the basic ground for conflict comes from the fact that with the Scientific Revolution a new science was born which claimed itself to be the only legitimate science of nature, opposed not only to the religious and theological understanding of nature but also to the other types of sciences of nature such as the Hermetic, which had survived into the Renaissance, but which were soon relegated to realm of "occult sciences" and superstition.

From the side of religion, there also occurred in Renaissance Europe the very significant event of the loss of the sapiental and dimensions of Western Christianity within mainstream religious thought with the result that there remained only a literalism and an anti-intellectual tendency which was defenseless before the challenges of modern science. There remained no sapiental and metaphysical school accepted by the mainstream churches which could integrate modern science into a more universal metaphysical framework. Those who did show interest in such matters were soon marginalized and became known as occultists, there being a few exceptions such as the German proponents of *Naturphilosophie*. But even in their case, they were not associated in an effective manner with institutional religion in the West.

5. What has been the role of religion in the development of science in the West?

Before the Scientific Revolution, science in the West was cultivated in monasteries and universities most of which were religious institutions. With the Scientific Revolution, many of these universities were transformed to become centers for the propagation of science while newly founded academies such as that of Lincei in Italy and Royal Society in England, which became great patrons of science, had many members from the religious community. There also came into being Catholic orders such as the Jesuit which propagated modern science. The impetus for the growth of science did not, however, come from the Church, but after the trial of Galileo Christianity did not oppose the development of science either except in certain cases where specific theological or ethical were involved. In the West, from the 17th century onward religion receded for the most part before the ever expanding claims of science and left the cosmos to science to explore without any appreciable religious opposition. Rather, in many cases there was encouragement from religious circles and some of the leading scientists were not only religious, but also member of religious orders, priests or ministers.

6. Can we have a religious science?

Of course one can have a religious science if the term includes the metaphysics which underlies the religious view of reality. The traditional sciences of the cosmos, whether Islamic, Indian or Chinese were sciences and at the same time religious in the sense defined above as were the Babylonian and Egyptian sciences. Even early Greek science was "religious" before religion, science and philosophy parted ways in the classical period of Greek thought. Something of "religious science" remained, however, in antiquity as can be seen in Pythagoreanism which refused to separate the qualitative aspect of numbers and figures from the purely quantitative. Even Aristotelian natural philosophy has a "religious" dimension. Hence, the ease with which it was integrated into the Islamic and later Jewish and Christian worldviews.

As for modern science, to the extent that it deals with an aspect of reality, it possesses a significance beyond the physical realm and has a "religious" dimension. Modern science has, however, set a limit upon itself which forbids it from delving into the religious significance of its findings and in facts it has no right whatever to do so. Metaphysicians and theologians (who may also be scientists) can, however, draw attention to the religious significance of what has been ascertained by modern science and of course not those materialistic philosophical assumptions which are at first accepted as hypotheses and end up by being taken as facts.

7. Can science dispense with religion?

Modern science, and not necessarily individual scientists, has already dispensed with religion and the truths of religion are irrelevant to its functioning. That is why in fact, if not integrated into a higher form of knowledge, the consequences of the spread of the scientific worldview including scientism and modern technology will end up by destroying the spiritual and ethical values of human society and ultimately the physical existence of society itself. There is no way to derive a workable ethics for the majority of people from modern science while scientism makes unreal those very structures of reality, both divine and human, upon which religious ethics has always been based. Many scientists would love to pursue their science in an ethical context while remaining oblivious to the effect of the scientific view of reality including the human which helps to destroy the very foundation of the religious ethics upon which all human society have been based until now, but it is unlikely that such scientists will be able to do so in the distant future.

8. Can one separate the domains of activity of science and religion completely?

For some time in the West many have sought to separate these domains as a way of creating peace and harmony between science and religion. In reality, however, such a separation is not possible because science claims for itself exclusivity of knowledge of the natural realm including the human body and now to an even greater degree the human psyche, while integral religion must also preserve its right to know the world of nature in an ultimate way. The activities of science and religion and their claims are therefore bound to collide and cannot be separated completely unless religion is relegated to an ever greater degree to the status of a subjective and private affair, having little to do with the objective world. This in fact is precisely what has happened in the West in recent centuries where in the mainstream culture religious knowledge is for the most part denied an objective status. But this event has itself led in our times to non-mainstream currents of religion seeking to re-discover the religious significance of nature including the human body.

The ideal situation would be to have authentic metaphysical knowledge, embracing knowledge of the Divine Principle and all Its levels of manifestation, as the framework for both science and religion, understood in the ordinary sense of the term, so that the two would share common principles. Such a situation has existed in traditional Islam as well as in other traditions. Without these metaphysical principles there is no way to create harmony between a science of the cosmos that is impervious to the Divine Origin of the universe, the presence of God in His creation, the higher levels of being, the sacredness of life and eschatological realities and religion which is precisely based upon those realities. In such a situation separation of domains means simply an even greater ghettoization of religion and its expulsion from the realm of nature and the world which surrounds man in his daily life. The result for most people is the turning of the realities with which religion deals into fantasy, day dreaming and irreality as can be seen so clearly in the modern world.

If there is any hope for an accord between science and religion, it is in situating science where it belongs, as a science of nature capable of knowledge of a particular dimension of physical reality and competent in allowing man to gain mastery over it, but not the only science of even the physical realm to say nothing of the higher orders of reality which are by definitions beyond its reach. There is no possibility of harmony between science and religion unless scientific reductionism is rejected *in toto*. The ever receding power of religion and limitations set upon its domain of knowledge and activity, far from creating accord, will result ultimately in the destruction of human society. This is an act for which champions and proponents of a totalitarian science, whose claim to totality is destroying, despite its many successes, what makes human existence possible, are to a large extent responsible, as are those men and women of religion who fail to understand the challenge of modern science to the religious view of existence and cannot therefore provide an adequate response.

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I do not believe that anyone should ever say that science agrees with religion. What I would say, which I think is far more powerful statement, and one which allows people to be religious, is to say, the modern observations of science do not disagree with religion.

Arno Penzias, Nobel Prize in Physics 1978

Wherever we may look, far and wide, we nowhere find a contradiction between religion and natural science. Quite the contrary, precisely on the decisive points we find complete agreement.

Otto Hahn, Nobel Prize in Chemistry 1944

We shall not expect the natural sciences to give us direct insight into the nature of the spirit.

Erwin Schrodinger, Nobel Prize in Physics 1933

1. What is your definition of science and of religion?

Science is a systemized body of knowledge that embodies two aspects: collection and classification of descriptive material and the understanding of the reasons for the various phenomena in terms of fundamental concepts. Science is limited to dealing with phenomena or concepts that can be verified or tested repeatedly. Hence, science cannot deal with questions focussing on human conduct and morality, or tackle the question of the ultimate reason for the existence of the universe. From the scientific perspective, these issues cannot be settled by empirical evidence. Science explains phenomena without invoking divine inspiration or intervention.

Religion can broadly be defined as a system of fundamental beliefs and practices that acknowledges the existence of a divine reality or a supreme being known as: the Almighty, Creator and Sustainer of the universe; Allah the one true God in Islam, a personal creator as in Judeo-Christian religions, or the principle of oneness as in some forms of Buddhism and Hinduism. All religions have given a high value to faith. They differ on how is 'faith' to be understood.

Western religions share certain claims such as: God has revealed certain truths, there is life after death and miracles happen, where these have often been understood as a violation of a law of nature by God's intervening in the world. Religion is associated with a worldview that embraces a moral code that guides the believer's actions and conduct.

2. Do you see any conflict between your definitions of these two concepts?

Science and religion are complementary concepts, not contradictory. Both are necessary for arriving at a genuine understanding of the universe and our place in it. Their ultimate goal is to arrive at truth and each approaches this end equipped with its tools and appropriate methods. We have, on one hand, scientific knowledge of the physical universe and divine revelation, on the other. Therefore, I see no conflict between the two concepts as science contributes to obtaining authentic knowledge of the physical world and its workings, and religion helps us in capturing the inner depths of reality, while providing perspective on the purpose and meaning of life.

3. Where do you think there may be a conflict between these two?

Science offers to explain phenomena in terms, whether observational of theoretical, that humans can understand without appealing to divine inspiration or interference. Hence, Scientists employ physical theories merely in classifying physical phenomena in order to help in comprehending them. Scientific knowledge is subject to revision and updating, it is probable not certain. Previously established notions may be overthrown or modified into different patterns.

Monotheistic religions have a central divine source of knowledge, that is, revelation, through which truth is revealed to prophets, who are chosen by God to spread His message. This sacred source is not subject to revision or updating. Hence, when contradictions occur between empirically proven knowledge and certain claims in Holy Scriptures, scientists disregard these sources as they lack empirical justification, even if they had to face accusations of heresy and persecution.

4. What have been the grounds for the development of conflict between these two?

In Western thought, science has often been used as a method for validating or discrediting aspects of religious thought. The scientific method was regarded by many as the way to deal with human issues. Hence, there was a call for empirical justification of beliefs: on one hand, there were philosophers, especially those of scientific orientation, who demanded that only beliefs which can be justified empirically could be accepted. Thus, those committed to this view, of whom there were many, felt themselves forced to reject religious claims as lacking empirical justification.

In the context of Western industrialization, which took place near the end of the sixteenth-century, intellectual 'enlightenment' and political and social revolutions inspired people to their relationship with the ultimate reality that they traditionally called 'God'. This period was marked by the emergence of trust in human beings' ability to reach enlightenment and truth by their own efforts, without reliance on divine revelation. Knowledge has become specialized and marked by the new scientific spirit that was completely empirical. Scientists felt that they have to consider Christian tradition and worldview from the scientific point of view. Scientists and philosophers were eager to verify the objective reality of God, just as any other physical phenomena. The traditional proofs of God were questioned and no longer considered adequate. Influenced by this enthusiastic scientific spirit, theologians started considering God like any other experienced phenomena, the objective reality of Whom can be tested. Certain religious views adopted by philosophers, prominent among whom were Absolute idealists, seemed empirically vacuous, wholly abstract and of minimal relevance to the believer's religious life.

5. What has been the role of religion in the development of science in the West?

Science and religion are roads to truth. The ultimate value of science is genuine knowledge of the way that the world actually is. It can be argued that religion and religious institutions played positive and negative roles in the development of science in the west. At certain periods, scientists practiced science in the context of religious frameworks. Some religious thinkers and philosophers integrated both religious and scientific ideas in their work. However, the conflict often occurs when scientific theories contradict Holy Scriptures. In the seventeenth century, the case of Galileo Galilei is an astounding example of conflict between science and the Catholic Church, the consequences of which was the birth of modern science. However, religion can be inspiring to scientists with strong religious commitments such as Isaac Newton and René Descartes. In the aftermath of intellectual enlightenment, the influence of religion and religious institutions on science declined and the call for the separation of science and religion was accentuated.

6. Can we have a religious science?

Within the accepted view of modern science, a religious science implies that science understood as such is combined with a religious worldview, or, at least, that science takes account of the religious implications of its findings. This seems to point towards a unity of science and religion, though both differ in their respective worldviews. But how is this possible, bearing in mind the defining characteristics of science and religion, and that there is no place in modern science for the concept of the supernatural or the concept of faith? To look for convergence or conformity between science and religion, one has to show that science conforms to religious worldview, of which there are many, and its professed ethics, and that religion can be empirically justified. Only then can we talk of harmony between science and religion and the possibility of religious science.

In the history of philosophy, William James (1842-1910) offers a genuine attempt to provide empirical justification for religious belief. He was highly skeptical of any religious view that does not take into consideration the empirical consequences of the religious hypothesis. For James, the religious hypothesis of God's existence is meaningless unless we can infer from it verifiable consequences in the world of facts.

For James, it is only the empirical consequences of God in the natural world which provide some objectivity to the idea of God, no matter how remote those objective consequences may be. It is also the means by which the religious hypothesis can be shown to be more objective and less subjective; in line with objective scientific hypothesis.

James even suggested the possibility of a critical 'science of religions'. The possibility of a 'science of religions' depends upon the abandonment of the vacuous formulations of theology and the concentration on the 'cash-value' of the religious hypothesis in the actual religious experiences of the individual believers. His account of religious experiences ascertains the empirical fact that in religious experience we come in contact with a larger consciousness, which we access through our subconscious.

James proposed to reconcile science and religion as follows:

(1) In addition to regarding both scientific propositions and religious propositions as similar in their origins, James argued that a religious hypothesis, such as the hypothesis of God, is subject to empirical verification, just as is a scientific hypothesis. However, what distinguishes scientific hypotheses is that they may already have been verified, while religious hypotheses await verification.

(2) The truth of the hypothesis of God, just as any scientific hypothesis, is determined by the satisfaction of the two conditions of truth, that is,

verifiability and satisfactoriness.

(3) Through experience, God or religion becomes accessible to us, like any other physical phenomena. We can claim to know it or relate to it.

(4) James also regards the hypothesis of God, like any other scientific hypothesis, as only probable,

7. Can science dispense with religion?

Modern science offers a worldview and so does religion. Our human knowledge cannot be complete in the absence of either. Our life experiences are enriched in the presence of these two worldviews, each of which contributes to human culture in its specialized domain.

Science has limited itself to empirical knowledge. Hence, science cannot offer guidance to human conduct or provide answers to the questions of meaning and values. We have already witnessed modern science (or scientists) dispensing with religion. We need to evaluate the impact of this scientific worldview on human civilization and designate the damage done thus far. Neither science can dispense with religion, nor can religion dispense with science.

8. Can one separate the domains of activity of science and religion completely?

These two domains are complementary and necessary for founding a comprehensive worldview that includes scientific and religious components. Science and religion cannot be wholly separated, as both are in a mutual interaction. Both are legitimate sources of knowledge of the natural world and our place in it. Religion cultivates our human values and spiritual side, and can inspire the progress of science. Science, which is concerned with objective and naturalistic issues, may be able to assist us in thinking about our moral ends, though it cannot determine their nature.

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1. What is your definition of science and religion?

This is a complex question. I suppose that people write entire books on what is meant by either science or religion.

Since I am a physicist, I will address only the natural sciences, by which I mean physics (under which I include astronomy and cosmology), chemistry, biology, earth science and the like. I leave out of this discussion disciplines like economics and sociology. I realize that even this taxonomy is insufficient to define what I include or don't, because of areas like paleontology. Be that as it may, perhaps even more important is to define how one comes to know things in a scientific discipline. The usual answer is to invoke the "scientific method", which is, in my opinion, ill-defined. In any case, I don't know any practicing research scientists who think about the textbook definition of the scientific method as they conduct their research. The key point for me is that knowledge is gained through experiments and observations whose results are repeatable, especially repeatable by other researchers. Scientists create theories, which I see as being intellectual constructs that can unify a lot of observations. The gold standard (not always possible to achieve) for the correctness of a theory is that it should predict previously unknown phenomena. Correctness of a theory is not static. More information in the form of additional experiments and observations can point to the need for a better or more complete theory. Such a new theory might represent a paradigm shift that does away with old ideas, or it might represent an addition to an older theory that preserves much of that old theory. Or something in between. One should distinguish between experiments in which one has control over the parameters and processes, as one does in a laboratory, and observations, as of astronomical objects, where one can repeat and refine the observations, but one cannot control the conditions of the objects being observed. Experiments typically yield the best and most reliable data upon which to base the evaluation of the correctness of a theory, but observations are nevertheless firmly within what is capable of generating scientific knowledge. As with anything, there is a range of possible quality of both experiments and observations, and one needs to keep in mind that the whole practice is done by people who have their own biases and preconceptions.

Defining religion is equally difficult. There are lots of different religions to which people adhere, and while many share similar qualities, not all share the qualities that some people would think are necessary features of religion. For example, most religions are "theistic" in the sense that they assert the existence of a god or gods, beings with an existence and possibly with powers that are outside the realm of usual natural science. But many would define non-theistic beliefs to nevertheless belong to the class of religions (certain branches of Buddhism, Confucianism,...) while others would classify these as philosophies. My own religious background is mainstream Protestant Christian, and in that context, for me at least, religion involves the belief in God, a divine being who created the universe, continues to interact with that universe, and who cares in a personal way for human creatures. Fundamental to religion in this context is that those who practice it have obligations to behave in ways that are consistent with what a loving God wants for God's creatures—namely loving and caring relationships between people and loving relationships between people and God. This kind of religion is "theistic" in the sense that it posits an interactive God. While I personally do not ascribe to a "deistic" religion, one that posits a creator God who does not interact in a personal way with creation, I would include that kind of thinking in the general category of religion. As with Science, one should discuss how one comes to know things in the sphere of religion. According to the Methodist tradition to which I belong, our faith is based on 4 pillars: Scripture, Tradition, Reason, and Experience. Stated this way, one could easily see a correspondence with the way students in scientific disciplines gain knowledge: Textbooks, research literature, theoretical reasoning, and experiments. The connection is made a little bit tongue-in-cheek. The ideas passed along to students in textbooks could, in principle, be independently verified by experiments (but they rarely are), while the ideas in scripture, at least in many cases, cannot. This does not mean that the scriptural ideas are not open to debate, but that they cannot be tested and verified by repeatable experiments or observation about which everyone will agree.

I admit that this short description of religion is inadequate and superficial, but being less of an expert on religion than I am on science, it is the best I can do under the circumstances.

2. Do you see any conflict between your definitions of these two concepts?

These definitions are rather different, but that difference does not imply a conflict, at least not in my mind. The key issue, for many people, is that many would claim that the way in which science gains knowledge is the only way to gain knowledge. I would say, instead, that the scientific method is the way to gain scientific knowledge, and that scientific knowledge is not the only kind of knowledge that there is, nor the only know of knowledge that is worthwhile. Spiritual knowledge is obtained differently from scientific knowledge (as are artistic knowledge, literary knowledge, knowledge of personal relationships, etc.), but it is, in my opinion, still knowledge.

3.Where do you think that there may have been a conflict between the two?

Historically, conflicts between science and religion have often been described as conflicts between a literal reading of religious scripture and an understanding of scientific results. Two famous examples from European and American history are the Galileo affair and the Scopes trial. Galileo was charged with heresy because of his promotion of the Copernican theory that the earth goes around the sun rather that the other way around. Scopes was prosecuted for teaching the theory of Darwinian evolution in defiance of a law. In each case, some people believed that the scriptures were in conflict with the scientific ideas, and famous trials resulted. Today, few people will promote a geocentric universe, but many still deny evolution. Obviously, the interpretation of scripture that held our universe to be geocentric is now considered invalid, almost universally. The interpretation of scripture that life on earth came about through special creation rather than through evolution, is less universally disavowed, but many religious folk are perfectly comfortable with the theory of evolution.

These are just two historical examples, and they are each complex and probably not to be seen as simple examples of a science-religion conflict. The Galileo affair was probably as much about power and how it should be applied to the thinking and philosophy of the time as it was about theology. The Scopes trial may have been motivated as much by the disreputable ideas of Social Darwinism as it was by a conflict of theology.

4.What have been the grounds for the development of conflict between these two?

One of the features of religious thought that has led to conflict with science is the literal interpretation of scripture. Scripture is many things—history, poetry, philosophy, theology, etc.—and it expresses these in ways that other forms of literature express them: chronicles, genealogies, metaphor, etc. For some passages of scripture, everyone agrees that the author was using metaphor (e.g. Psalm 23 of the Hebrew scriptures), while for others, there is bitter disagreement (e.g. Genesis 1) between those who identify the passages as metaphoric and those who see them as literal. When a passage of scripture is seen to be literal, and that passage describes something clearly different from a scientifically known fact, there is going to be conflict. As long as about 1600 years ago, St. Augustine of Hippo warned against interpretation of scripture that was in conflict with the clear evidence of our senses, and yet we still face such interpretation.

5. What has been the role of religion in the development of science in the West?

This is not something about which I know much. I have heard it argued that Christianity in general and the Protestant Reformation in particular have provided a theological encouragement for people to investigate nature in order to determine the character of God's creation. Some philosophers, especially some classical Greek philosophers, believed that things were the way they were because they could not be otherwise. Some Christian thought held instead that God was free to make the universe how God wanted it to be, and therefore experimentation and observation were the ways to learn about the physical world, as opposed to pure reasoning. The idea that experiments and observation are the route to understanding of the physical world is one of the hallmarks of the scientific revolution and the scientific method.

6. Can we have a religious science?

If this question means "is it possible to have consistency between religion and science" then yes, why not? The two fields generally deal with different kinds of questions and when sometimes they both address the same questions (an example might be about the wisdom of editing the human genome) then as long as it is understood that each brings a different perspective to the problem, there is no difficulty, in my opinion. Furthermore, if a religious belief encourages a scientist to study nature because that endeavor is studying the handiwork of God, then so much the better. If religious beliefs encourage a scientist to draw conclusions that are opposed to the results of observation or experiment, that is not acceptable.

7. Can science dispense with religion?

Certainly, there are plenty of scientists who have dispensed with religion, and plenty of them do good science. But there is a cost for doing so. As just one example, if the public perception of science is that science is conducted by people with no connection to religion or with an antagonism toward religion, it will be difficult to convince that significant part of the population who are religious that scientific understandings are correct.

8. Can one separate the domains of activity of science and religion completely?

One could separate the domains, but doing so is unwise, for reasons discussed above. Among the reasons are that some problems benefit from the perspective of both domains, and public acceptance of science is hurt by such separation.

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Publications: Ted Peters served as Editor-in-Chief of *Dialog, A Journal of Theology*. from 1993 to 2007 and continues as co-editor of *Theology and Science* from 2000 to date. He has published 15 single author books and co-authored, edited, or co-edited 20 other books. He also published more than 300 peer reviewed scholarly articles plus three works of fiction. His *magnum opus* is a systematic theology, *God—The World's Future* (Fortress, 3rd ed., 2015). In the field of Science and Religion, Peters has recently authored *God in Cosmic History* (Anselm Academic, 2017) and co-edited *Astrotheology: Where Science and Theology Meet Extraterrestrial Life* (Cascade, 2018). Along with Muzzafar Iqbal and Nomen Haq he co-edited, *God, Life, and the Cosmos: Islamic and Christian Perspectives* (Ashgate 2005).

1. What is your definition of science and religion?

Religion and science are like two different languages speaking about the same reality. We need, first, to become bilingual, to speak both languages. Then, second, we need to merge their linguistic horizons into a confluent grasp of the one reality within which we live.

When religion speaks, it provides meaning at the level of human understanding where subjectivity and objectivity are so at one with one another that they are undifferentiated, or at least pre-differentiated. When science speaks, it provides knowledge of the objective dimension of reality, almost pretending that human subjectivity does not exist.

Modern science is the systematic search for an objective explanation of specified natural phenomena that makes use of observation, experiment, and reasoning. Over time science produces a body of ordered knowledge that describes the natural domain in terms of the laws which account for efficient causation. This collection of laws *de*scribes what happens; they to not *pre*scribe what should happen. This makes science in its authentic form value-free, untethered to moral or ethical norms. In practice, science is a communal endeavor in which individual scientists correct and expand one another's advances, sometimes turning scientific knowledge into technology.

Initially, religion looks quite different. I use the term, *religion,* for at least two purposes. First, this term designates those traditions and institutions we commonly know as the world's religions which include stable symbols, belief systems, ritual practices, teaching authority, and cultivated spiritual sensibilities. According to this first use, an individual can choose to be either religious or non-religious, to belong or not. Second, *religion* designates the depth of culture. Culture is the form of religion and religion is the substance of culture, theologian Paul Tillich said frequently. Our culture shapes our subjectivity from within, binding us to a world of meaning grounded in one or another symbol of ultimacy. In this second use, it is difficult to choose whether or not to be religious because the religious depth operates from within the very subjectivity that would make such a choice.

Defining these two terms is insufficient for dealing with the challenges posed by this set of questions. We must add a third term, *theology.* Within religious discourse, some speak the dialect swe know as theology. Theology is rational reflection on religion, especially reflection on human awareness of transcendence endemic to religious sensibilities. As such, theology belongs within religion but, in addition, theology connects religion with every other domain of rational discourse, including science.

Just because religion and science speak different languages, is this sufficient warrant for conflict, or even war?

2.Do you see any conflict between your definitions of these two concepts?

On the one hand, in principle, there should be no conflict between modern science and traditional religion. If anything, rational theology should be in a position to merge the horizons of the two. On the other hand, history has treated Western civilization and the Islamic world as battlegrounds in a war for intellectual dominance. Since the Napoleonic era, some within the scientific community have raised the flag of objective knowledge while attacking religious claims for their anachronism, rigidity, and premodern authority. The *esprit de corps* for this attacking army derives from its adoption of a hidden dogma, namely, that scientific knowing is the only legitimate form of knowing, thereby rendering religious claims invalid. Religion becomes *de facto* the enemy of science. But, before we take up the matter of warfare, let's delineate what peaceful co-existence could look like.

In principle, there should be peaceful co-existence between science and religion because they speak two different languages. Each represents an independent perspective on the one reality in which we all live.

Whereas science speaks of objective facts, religion speaks of subjective meaning.

Whereas science constructs a body of knowledge about the physical world, religion experiences a more fundamental understanding that connects the physical world with its spiritual dimensions.

Whereas science analyzes this world, religion intuits the divine which transcends this world.

Whereas science is value neutral, religion provides society with its value orientation.

Whereas science asks "what?", religion asks "why?"

What makes for a happy civilization is that each of us speaks both languages, the language of science and the language of our religious faith.

So, we ask: why don't we enjoy peace and tranquility?

3. Where do you think that there may have been a conflict between the two?

4. What have been the grounds for the development of conflict between these two?

5. What has been the role of religion in the development of science in the West?

Going to war against Christianity in Europe and against Islam in Asia seems warranted, from the point of view of the generals leading the science army, because religion is backward and science is enlightened. Science is progressive, whereas religion is regressive. The new language of science should exhaustively replace the old language of religion in the public square.

The history this army teaches itself commemorates brave defenders of scientific truth who were martyred at the hands of ossified religious anti-intellectualism, superstition, and belligerence. The Muslim mob action that destroyed the astronomical observatory of Ulugh Beg (1394-1449) in Samarkand only confirms Marxist-materialist belief that religion is the opiate of the people. The Vatican action to put Galileo Galilei (1564-1642) under house arrest for supporting Copernican heliocentrism provides todays' Western scientist with evidence that Roman Catholic authoritarianism is incapable of incorporating empirical science. For some the ghastly Galileo story includes his being jailed or burned at the stake; but the historians assure us that it was merely house arrest.

Be that as it may, this version of religious history is rife with reluctance if not recalcitrance in the face of new scientific discoveries, especially scientific theories that appear to contradict the premodern worldviews accompanying ancient sacred texts and defended by ecclesial authorities.

In its arsenal, the anti-religion military arms itself with skepticism, critical thinking, reason, and most importantly, the belief that science and only science is the source of reliable human knowledge. The anti-religious forces within the international scientific community see themselves as the champions of global civilization because they represent truth, open-mindedness, progress, and all the values of the European Enlightenment.

Religious forces mount both a defense and an offense. In their defense, Western Christians and Jews claim to have mothered the birth of modern science. The young scientific Turks are out of line for disrespecting their religious parents. Roman Catholics point out their noble intellectual tradition, especially the fact that the founders of modern science—Copernicus, Kepler, Galileo, and Newton--were all devout Christians who assumed theology and science belonged together in a single worldview. Having borrowed Galileo's telescope, the astronomers and astrophysicists at the Vatican Observatory continue their research still today and contribute to the advance of scientific knowledge about the heavens. Similarly, in Great Britain the Church of England reminds us that the Royal Society, one of the most respected of the world's scientific institutions, was founded and led for centuries by divines, by clergy.

That's the religious defense. For offense, we turn to the anti-evolutionist platoons in fundamentalist Christianity and Islam. The only field within the sciences that upsets conservative Christians and Muslims is Darwinian evolution; they shout no objections to mathematics, physics, chemistry, or technology. Specifically, the armies of Creationism and Intelligent Design attack Charles Darwin's evolutionary biology and Herbert Spencer's Social Darwinism on multiple grounds: evolutionary theory is poor science; it contradicts what is written in the Bible and the Qur'an; it teaches a morality of survival-of-the-fittest instead of compassion; it is racist; it is nihilistic; and Social Darwinism is responsible for World War One. If Social Darwinism is evil, then the science that underlies it must also be evil.

One of the unacknowledged facts sitting in plain sight is this: everyone likes science. Virtually no combatant with religious credentials categorically opposes science. Even the Creationists embrace all the fields of science with one exception, evolution. And when arguing against evolution, they cite science to critique evolutionary theory. There is a war going on, to be sure; but it is not a war where religion takes an anti-scientific stance.

In Berkeley, California, I work with physicist-theologian Robert John Russell at the Center for Theology and the Natural Sciences. We tender a proposal: let's build a bridge across the perceived chasm between the world as viewed scientifically and the world as viewed theologically. There can be only one reality, we assume. So, hypothetically, the honest pursuit of truth should lead us eventually to consonance. The Christian theologian is persuaded by Holy Scripture that the God who creates and redeems the natural world is gracious and loving. Such a claim should not, in principle, be dissonant with what we find in the laboratory or the computer. Hypothetical consonance between scientific discourse and religious discourse provides the confidence we need for bridge building, for peaceful confluence.

In summary, two things obtain. On the one hand, in principle, warfare between science and religion is unwarranted. The two can live peacefully with one another and perhaps even become compatriots in maintaining a healthy and progressive civilization. On the other hand, when theologians claim that their ancient texts trump the findings of modern scientific research, or when scientists claim to own the patent on all knowledge belonging to the human race, we can expect sparks to fly.

6. Can we have a religious science?

I hesitate to affirm the concept of a religious science. Today's laboratory scientist looks through the microscope or the telescope for only one thing, namely, the laws of nature. The scientist is committed to a method of research that unflinchingly restricts itself to one and only one form of explanation, efficient causation. Systematically excluded from view are supranatural or miraculous or moral or divine factors right along with subjective factors. Like a fish net, the scientific sieve filters out everything except natural explanations for natural phenomena. For four plus centuries now this focus has yielded a cornucopia of new knowledge that the entire world imbibes. Science should be celebrated by everyone, even those who do not understand science.

Nevertheless, the philosopher and the theologian can plainly see how the focus within scientific research excludes certain dimensions of reality. Certainly, nothing in reality can be fully understood apart from its relation to the God of power and love. Nor apart from its meaning to human subjectivity. With this in mind I offer the following: we should not construct a religious science if it would mandate the researcher to give up his or her focus on efficient causation. Our comprehensive worldview, wherein we understand all things in relationship their loving and gracious God, will require extra-scientific if not theological contributions. The new language we come to speak would merge the frameworks of both science and religion in a single more comprehensive horizon of understanding.

7. Can science dispense with religion?

8. Can one separate the domains of activity of science and religion completely?

Yes, science can dispense with religion, but civilization cannot. Albert Einstein told an audience at Princeton in 1938 that science provides facts and religion provides values. Civilization needs both, he said.

For methodological reasons, the laboratory researcher should be allowed to retain his or her focus on efficient causation along with the formulation of objective theories to explain natural phenomena. Theories need not put God into their equations. Nor need they put in values, moral principles, subjective preferences, or personal biases. All these can be bracketed temporarily in order to keep focus on the data. All these can be added when the two languages converge into a shared confluence.

Because of the exclusive focus of scientific research, however, the scientist must accept with humility that his or her knowledge does not exhaust reality. Science provides a perspective on reality, we happily grant; but not reality itself. To claim imperialistically that science is king and that all other forms of human understanding must bow and scrape before the lab bench constitutes a gross power grab. The fallacy of what we call *scientism* is that its adherents arrogantly believe that scientific knowledge is the only form of knowledge that yields truth. It is public reveling in this fallacy which sparks culture wars.

The task of what St. Thomas Aquinas in the twelfth century called *sacred science* is to demonstrate the harmonious relationship of all things in reality to the one God, the creator and redeemer. More recently this comprehensive vision has been lifted up by Shiite Seyyed Hossein Nasr and Lutheran Wolfhart Pannenberg.

Here is the point: we do not know things as they really are unless we grasp their identity in relationship to God who values them. If the one God of the one cosmos is loving and gracious, as some theologians claim, then we cannot understand any individual thing or even a law of nature unless we see it in relationship to the God of love and grace. To perceive this truth requires a degree of extra-scientific discourse and religious reflection. For the near future, this interpretive responsibility will fall to the bilingual theologian who speaks the language of religion while incorporating the grammar of science. In constructing a comprehensive vision of all things in relationship to God, the theologian must build into this worldview all the treasures of modern science.

Prof. Hans S. Plendl

Date of Birth: June 12, 1927 (Berlin, Germany)

Education: B.A. in Physics form Harvard (1952), M.A. in Physics from Yale (1954) and Ph.D. in Physics from Yale (1958).

Post-Doctoral Professional Experience: Joined Florida State University in 1956; Assistant Professor of Physics (1956-64), Associate Professor of Physics (1964-74) and Prof. of Physics (1979-1995); Led a Nuclear Structure research group at Florida State University; participated in Nuclear and Particle Physics Experiments at Oak Ridge, Brookhaven and Los Alamos National Laboratories and at Research Centers in Juelich and CERN. Since his retirement in 1995, he has worked on the applications of Nuclear Physics to the solution of environmental problems caused by nuclear waste materials.

Publications: He is the author or co-author of over 140 scientific articles, 16 articles on the philosophy and the teaching of physics, and the editor or co-editor of 4 books.

1. What is your definition of science and of religion?

Both science and religion are human endeavors that try to find answers to basic questions such as the creation of the world and of humankind; the relationship between humankind, the world, and the forces that caused it to come into existence; the eventual fate of humankind and of the world. Science tries to find answers to such questions primarily by observation, experiment and logical-mathematical reasoning, religion primarily by faith and revelation.

2. Do you see any conflict between your definitions of these two concepts?

3. Where do you think there may be a conflict between these two?

I see no real conflict between the two: Science and religion are complementary to each other. Throughout history, there have been serious conflicts between theologians and scientists, but these conflicts have been overcome by recent developments in science and new insights in religion. Today, these old conflicts persist only in the minds of those scientists who demand a strict logical-mathematical description of observed phenomena and of theologians whose tradition demands a literal interpretation of sacred writings. New conflicts of a temporary nature do arise when advances in science lead to questions of moral and theological nature. Such questions can and must be resolved by discussion among scientists and theologians of all the issues involved. Without such discussion, serious rifts between scientists and theologians are bound to develop over the implications of such recent scientific advances as the cloning of animal and possibly human life.

4. What have been the grounds for the development of conflict between these two?

Conflicts between science and religion appear to develop when scientists assume that all phenomena can be explained by science alone or when they demand that scientific investigations must proceed no matter what the moral consequences are. Such conflicts also arise when theologians assume that they can ignore new scientific insights.

5. What has been the role of religion in the development of science in the West?

Science developed in the West by consciously separating itself from religion as much as possible. Many individual scientists continued to be followers of a religion in their personal lives, but they kept their religious beliefs and their scientific work separate, even when they contributed to both scientific and theological thought, as a few did, foremost among them Isaac Newton. Attitudes have changed considerably during the second half of this century because of recent developments referred to in [2, 3] above, so that it is not uncommon now for scientists to openly admit their adherence to a religious creed and even to hold positions in a religious institution.

6. Can we have a religious science?

To my mind, religious science is a contradiction in terms: It cannot exit, just as a scientific religion cannot exit. Science and religion are complementary but not interchangeable human activities; their premises and their methods are different.

7. Can science dispense with religion?

8. Can one separate the domains of activity of science and religion completely?

Science did dispense with religion as it developed, and it can continue to dispense with it in its further development. But scientists and theologians must interact when scientific advances result in moral questions. "Science sans conscience est la mort d'ame".

Prof. John Polkinghorne

Date of Birth: Oct. 16, 1930 (Weston-Super-Mare, U.K.)

Education: B.A in Physics (1952), M.A in Physics (1956), Ph.D. in Physics (1956), Cambridge University.

Post-Doctoral Professional Experience: Lecturer in Mathematical Physics (1956-1958); Lecturer in Mathematical Physics (1958), Reader (1965), Professor of Mathematical Physics (1968-79), Cambridge University; Elected as Fellow of Royal Society (1974); Resigned Professorship to train for the Anglicain Priesthood; Ordained Deacon (1981); Priest (1982); Vicar of Blean (1984-86); Honorary Professor of Physics (1984), University of Kent; President of Queens' College (1989-1996); Chairman of several committees offering advice to Government on ethical and social issues related to new developments in science and technology.

Awards and Honors: Honorary DDs from the universities of Kent (1994) and Durham (1999); Honorary DScs from the Universities of Exeter (1994), Leicester (1995) and Marquette (2003); received a Knighthood (1997), received Uon Humboldt Foundation Award (1999); was awarded the Templeton Prize for Progress in Religion (2002).

Publications: Many papers on theoretical particle physics; two technical scientific books; many books on issues concerning science and religion, including *Quarks, Chaos and Christianity* (1994); his Gifford Lectures: *The Faith of a Physicist* (1994); *Scientists as Theologians* (1996); *Belief in God in an Age of Science* (1998); *The God of Hope and the End of the World* (2002).

1. What is your definition of science and of religion?

Science and religion is the endeavour to take with equal and appropriate seriousness the insights of science and religion, with their complimentary perspectives on reality, and to understand the relationship between them. I believe that this intellectual "binocular vision" enables us to perceive the world more truly and fully than either view would on its own.

2. Do you see any conflict between your definitions of these two concepts?

I do not see a conflict between the two approaches. They are both concerned with the search for truth, though they pursue that quest at different levels, the one investigating the processes of the world, the other asking the deeper question of the meaning and purpose behind what is going on. Of course, there are some puzzles about how the two views relate to each other, just as there are sometimes puzzles about how two different branches of science are related.

3. Where do you think there may be a conflict between these two?

There is only a conflict when one side or the other tries to trespass illegitimately on the territory of the other. Religion cannot directly tell science how questions should be answered, and neither can science pretend to tell us directly about the nature of God.

4. What have been the grounds for the development of conflict between these two?

Conflict arises from attempts at imperialist takeover, as when the Church mistakenly tried to tell Galileo how to think about the planets, or atheist scientists tell us that we are no more that genetic survival machines.

5. What has been the role of religion in the development of science in the West?

All the Abrahamic faiths believe that God's mind and purpose is behind the existence of the universe, so that there will be a deep rational order in its structure; that God freely chose what sort of world to create, so one has to look and see (experiment) if one is trying to discover with what order the Creator chose to endow the universe; that the universe is worthy of study because it is a world that has been given an intrinsic value by God, its Creator. These three foundational beliefs are strongly encouraging to the pursuit of science in its modern form. It is certainly the case historically that the initial development of science took place largely at the hands of Jewish, Christian and Moslem believers.

6. Can we have a religious science?

Religion encourages the search for truth and in that sense it supports the activity of science. However, I believe that scientifically stateable questions may be expected to receive scientifically stateable answers and in that sense, science, within its own self-limited domain, does not require augmentation from religion.

7. Can science dispense with religion?

Whilst I believe that science does not need to appeal to religion to find the answers to its own restricted set of questions, the search for understanding, so natural to the scientist, will soon take him or her outside the bounds of science. "Limit questions", such as "Why is the universe so deeply intelligible and rationally beautiful?" or "Why has the cosmic history been so astonishingly fruitful (turning an initial ball of energy into the home of saints and scientists)?", arise from our experience of doing science but they are not questions that science itself can answer. I personally believe that religion provides the most illuminating and intellectually satisfying responses, when it sees the Mind and Purpose of God as the ground of cosmic order and fertility.

8. Can one separate the domains of activity of science and religion completely?

Limit questions, referred to above, link the two domains. A further important connection arises from the need for the moral wisdom that will enable humans to make the right uses of the technological power that flows from scientific discoveries. The great faith traditions are important reservoirs of wisdom in moral matters.

Michael W. Poole

Date of Birth: Feb. 14, 1936 (Worthing, Sussex, UK)

Education: B.Sc. (1957) in Physics and M. Phil (1983) in Education in Science and Religion, King's College, London.

Post-graduate Experience: Director of Farmington Science and Religion in Schools Project (1986-88); Director of the Science Education Project in the Church and Associated Colleges Project *"Engaging the Curriculum"*, published as *Teaching about Science and Religion: Opportunities within Science in the National Curriculum* (Abington: Culham College Institute, 1998); Lecturer in Science Education (1973-91), King's College, London; Currently, Visiting Research Fellow in Science and Religion, Department of Education & Professional Studies, King's College, London ; Chairman of Science & Religion Forum (2000-3).

Publications: 70 publications in Science, Religion and Science education, including: *A Guide to Science and Belief* (Oxford: Lion Publishing, 1990, 1994, 1995, 1997) and *Beliefs and Values in Science Education* (Buckinghamshire: Open University Press, 1995).

Awards: John Templeton Foundation: Science & Religion Course Award (1995); 'Humility Theology Award' in 1996 for 'A Critique of Aspects of the Philosophy and theology of Richard Dawkins', *Science and Christian Belief,* 6 (1) 41-59, (1994); One of 12 international awards for 'Quality and Excellence in Teaching Science and Religion' (1998).

1. What is your definition of science and of religion?

I would not attempt a formal definition of either, since there so many religions in the world, some of which have no concept of God. Also, there are many different sciences, some of which, like cosmology and geology are historical in nature and non-repeatable, while others such as physics and chemistry are more concerned with repeatable experiments. Broadly, I see religion as involving belief in, and response to, God. Science is a systematic study of the natural world, employing particular methodologies and criteria for testing its truth claims. It formulates testable hypotheses, theories and laws, as well as employing conceptual models in order to understand and explain natural phenomena.

2. Do you see any conflict between your definitions of these two concepts?

I do not see any conflict between the concepts of science and religion. Largely speaking, their concerns are different and it is a mistaken view of both science and religion to see religion as filling in the gaps still remaining in scientific understanding.

3. Where do you think there may be a conflict between these two?

Conflicts may occur if a religion contains, in writings which it claims are inspired, statements about the natural world which may be in disagreement with statements made by science about similar subject matter. Great care needs to be taken, though, because religious writings utilise a great variety of literary *genres* and the author's intentions may easily, in the twentieth century, be mistaken as saying something scientific when their purpose is otherwise.

4. What have been the grounds for the development of conflict between these two?

There have been three main reasons for the development of the idea of conflict between science and religion. They concern *the data of science, the nature of science* and *rival struggles for power*.

The data of science

As indicated in (3) above, conflicts may occur if statements in sacred writings appear to conflict with the *data* of science. Traditionally, the debates have been about issues like the origins of the universe (stellar evolution), life (chemical evolution) and species (organic evolution) as well as the position, status and age of the earth.

The nature of science

The *nature* of science has sometimes been presented, wrongly in my view, as in opposition to religious belief. The issues which have arisen in this category concern the scope, limitations and status of science and include that once fashionable philosophical system known as logical positivism. They also incorporate matters of determinism, freewill, chaos theory, miracles, scientific laws, the uniformity of nature, orderliness, causality, explanations, reductionism, emergence, language (analogies & models) and creation.

Rival struggles for power

Struggles have taken place, as for example in England in the nineteenth century, to wrest cultural supremacy from religious authorities and to transfer it to the scientific community. Part of the strategy for trying to accomplish that end was to promote popular presentations of science as antagonistic to religion.

5. What has been the role of religion in the development of science in the West?

Belief in a rational, orderly, non-capricious God inspired a measure of confidence in human reason, as well as a belief that nature, too, was orderly and intelligible. Without such beliefs in rationality, orderliness and intelligibility, science is impossible.

God's command to manage the creation appeared to encourage science as a way of doing it, since it seemed likely that the creation could be managed better if one knew how the world worked.

God, it seemed, could be glorified through a scientific study of the world which could help alleviate suffering and also disclose God's wisdom and power.

Creation was viewed as a free act of God and so experiments needed to be done to find out about it, rather than looking to reason alone for answers, or to the writings of authorities such as Aristotle.

Where God was identified with the world (pantheism), as was the case with some of the ancient Greeks, experimentation on a semi-divine nature was seen as something like sacrilege. Experimental science was consequently discouraged by such a view. However, where there was widespread belief in a God who was distinct from creation (although involved with it), that obstacle was removed.

6. Can we have a religious science?

If by "can we have a religious science?" is meant "can science be practiced and accommodated within a religious world view?", the answer is clearly "Yes". Christian, Jewish and Islamic scientists see science as a major human activity operating within the wider perspective of a world which God has created and for which He holds us responsible. But a person does not have to hold religious beliefs in order to be a scientist, and many people do not hold such beliefs.

7. Can science dispense with religion?

If this question means "can one do science without being a religious believer?" the answer, as indicated above, is "Yes". If it means "does science do away with religion?", the answer is "No", in spite of frequent claims that it can.

8. Can one separate the domains of activity of science and religion completely?

I do not think these two domains can be completely separated. Certainly, there are logical differences in their concerns and their methods. But since religion is concerned with the whole of life, and science is a major component of human activity, there is an interplay between the two. Furthermore, as indicated in (5), belief in God leads one to expect the world to be orderly, intelligible, rational and largely uniform in its behaviour – presuppositions without which there could be no science. Furthermore, the moral aspects of religion can inform decisions about the *applications* of science.

Prof. Mazhar Mahmood Qurashi

Date of Birth: 1925 (Pakistan)

Education: Ph.D. in Physics (1949), Manchester University; D. Sc. (1962), Manchester University.

Post-Doctoral Professional Experience: Chief scientist in the Ministry of Defense, Pakistan; Professor of Physics at Quid-e-Azam University; Member, Pakistan Council of Scientific and Industrial Research; Director General, Appropriate Technology; Director of Studies at National Science Council; Director General, National Physical Standards Laboratory; In 1964, he was elected as fellow of Pakistan Academy of Sciences; In 1972, he was awarded Open Gold Medal of Pakistan Academy of Sciences; Secretary General of the Pakistan Academy of Sciences (1988-92); Secretary of Pakistan Assoc. Hist. & Phil. Sci (since 1988); In 1988, he was elected as fellow of Islamic Academy of Sciences. He was awarded Sitara-Imtiaz in 1991.

Publications: Over 190 research papers in various topics in applied physics, physical chemistry and scientometrics.

1. What is your definition of science and of religion?

Science: Systematic knowledge of nature, based on study of reproducible phenomena, so as to determine the laws governing these and their immediate causes, and to utilize these for human uses;

Religion: An organized system of faith and worship of God (Allah) as a supreme power, entitled to total obedience in our daily personal, social and collective conduct, usually with the hope of ultimate reward after death.

2. Do you see any conflict between your definitions of these two concepts?

No. There is, in fact, a certain region of overlap, which could be considered as a corollary to the proposition that the universe and also its laws are made by its Creator; these laws encompass the physical, biological, social and spiritual spheres, and the overlap may be exemplified by psychokinesis, E.S.P., socio-economic theory, etc. [see fig.1(*a*)].

3. Where do you think there may be a conflict between these two?

In areas like mysticism and social science, where the parameters and assumptions regarding human behaviour are numerous but ill-defined, and where human free-will, supplication, etc., operate. The increasing

margin of error or deviations from causality, as we go from physical sciences to biological sciences, and then going on to social sciences, indicates the imperfectness of our knowledge of their laws and also leads to situations of conflict, e.g., the social scientists may propose a short-term remedy, with after-effects, [fig.2(*b*)], while a particular religion may prescribe a workable long-term remedy. Of course, there is inadequate understanding of the limitations of scientific studies. [see fig.2(*a*): Region of uncertainty from 50% to 90%].

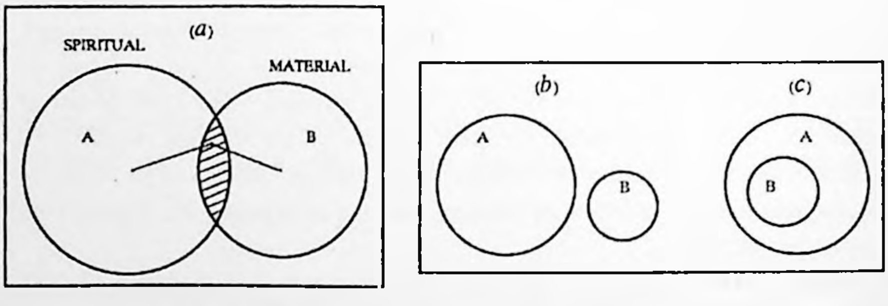

Fig. 1. POSSIBLE RELATIONS BETWEEN SYSTEMS "A" & "B".

4. What have been the grounds for the development of conflict between these two?

a) Dogmatic extrapolation of the laws/rules of one domain into the other domain, without adequate study of their limitations and definitions [see fig.1(*c*)], e.g., in going from the physical to the spiritual domain. A careful study of phenomena like extra-sensory perception and psychokinesis may help to resolve this conflict.

b) Most religious philosophies tend towards "mystification" of phenomena, looking for the most far-fetched explanation rather than the obvious one, or insisting that the ignorance of something is inherent or universal, whereas science favours the simple and direct explanation, as well as the spread of knowledge of reproducible phenomena to all mankind.

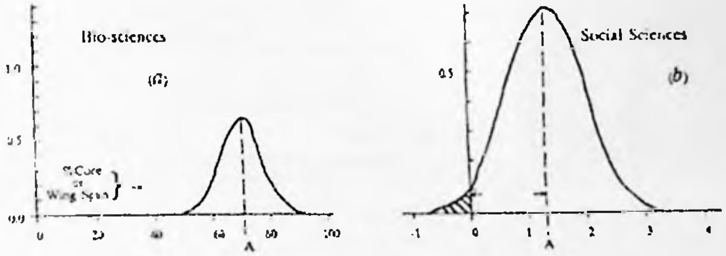

Fig. 2.

5. What has been the role of religion in the development of science in the West?

a) Man has always wished to know why certain phenomena occur: Mythology was developed mostly to cover up this lack of knowledge, and so religious myths were frequently diametrically opposed to later scientific explanations. Hence, the role of religion has been two-faced, the myths taking a long time to die.

b) The revealed religions have tended to "get rid of false gods" and so have tended to be associated with more or less rational explanations of physical and sociological phenomena and, therefore, also with science; but have frequently succumbed to prevalent myths, which took a long time dying out. So, there was initial religious support for science as an exploration of the Creator's purpose, followed by antagonism later in the West.

c) The Islamic impulse operating for the first 6-8 centuries generated a scientific attitude that was later taken up by the West as a part of the worship of God, to begin with, but soon fell foul of Church dogma, [see fig.1(*c*)]. Today, western scientists are evenly divided into those who see a connection with religion (fig.1*a*) and those who want the two to be separate (fig.1*b*).

6. Can we have a religious science?

Yes; to some extent, it is possible to develop a science that sets out to be in consonance with human spiritual values. Some requirements for this would be:

(i) Recognition by scientists of the fact that humans have a spiritual as well as a physical/biological existence;

(ii) Re-organizing education in a comprehensive manner, so as to take account of the three major sources of knowledge, viz. observation & experiment, logic & philosophy, intuition & revelation, so that system A and B in fig.1 can coexist and interact as in fig.1(*a*);

(iii) Replacing current myths or mythologies with only that which is incontrovertible. A dialogue between scientists and theologians is essential for future progress.

7. Can science dispense with religion?

No; because the application of all sciences is ultimately for human beings who have mental as well as spiritual faculties, which interact with their physical faculties all the time. The disastrous results of neglect of moral and religious considerations are particularly evident in the case of various recent technologies, e.g., nuclear technology, information technology, biotechnology.

8. Can one separate the domains of activity of science and religion completely?

No. In fact, there is a definite overlap between these two, as indicated in fig.1(*a*), which varies from one scientific discipline to another. It is this region of overlap that merits careful and deep study, as indicated in several recent papers by M. M. Qurashi and other scholars[1]. Further study of the nature of the uncertainties in fig.2 may well lead to a better understanding of the interconnection between the physical and spiritual domains.

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[1] S. Kocabas, MAAS J. Isl. Sci, 1987, 3 (1), 33-43.
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M. Golshani, Isl. Th. & Sci. Creat., 1995, 6 (2), 7-32..

Prof. Karl Helmut Reich

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Education: Studies in Physics and Electrical Engineering at the Universities of Köln, Aachen, Braunschweig, Paris and Nottingham; Doctoral degree in Physics (Nottingham) and in Electrical Engineering (Braunschweig). Social Science studies at the Universities of Braunschweig and Fribourg.

Post-Doctoral Professional Experience: (Visiting) Research Fellow at Harvard (1955), Brookhaven National Laboratory (1965/66), Dortmund University, FRG (1983), Tokyo State University (Todai, 1984); (Senior) Physicist at CERN (Geneva, Switzerland, 1955-1983); Research Fellow at the Pedagogical Institute of Fribourg University (German Branch, since 1984); Professor Stratford International University at Richmond (British Columbia, Canada) and Evanston (Wyoming, USA), School of Religious Studies and Sacred Traditions; Consulting Editor of the *International Journal for the Psychology of Religion* (since 1995).

Awards: Templeton Foundation Award for an article in Humility theology (1995). William James Award of the American Psychological Association, Division 36 (1997).

Sample Publications: Developing the Horizons of the Mind: Rational and Contextual Reasoning and the Resolution of Cognitive Conflict (Cambridge University Press,2002); Co-editor of five edited volumes on Religious Development and on Relational and Contextual Reasoning; co-author of some 20 chapters in various books; dozens of articles in peer-reviewed professional journals.

1. What is your definition of science and of religion?

a) Science is a human enterprise aimed at investigating order and regularity in the natural world. Pragmatically, the knowledge gained serves in the best of cases to support life in all aspects, in the worst of cases, unfortunately to destroy life. At a deeper epistemological level, science aims at understanding as much as possible about the structure of the world and the processes taking place. Science essentially aims at finding causal explanations, and hence is on the lookout for antecedent conditions, which would explain the consequent state. Hence, science cannot explain a step from nothing (no matter, no energy, no space, no time, no "natural laws", etc.) to something. It cannot explain why there is something rather than nothing.

b) Religion is a multifaceted phenomenon, found in practically all human cultures. It is a major attempt (1) to come to terms with the contingencies of life, the events human beings cannot control, and which could occur differently, or even not at all, at least at that particular moment in time (such as natural disasters including flooding, long periods of drought, earthquakes, illness and death, etc.), and (2) to provide a framework for societal and individual life, which ensures social cohesion, gives meaning, and fosters stability and continuity, yet is (slowly) adaptable to changed circumstances.

2. Do you see any conflict between your definitions of these two concepts?

The two definitions (1a,b) being rather abstract, they can be interpreted in such a way that conflict is avoided, but also in the opposite way. I have written two articles about that issue:

(i) The doctrine of the Trinity as a model for structuring the relations between science and theology, in *Zygon: Journal of Religion & Science* 30, no.3 (September), 1995, 383-405. (John Templeton Foundation Award)

(ii) A logic-based typology of science and theology, in *Journal of Interdisciplinary Studies* VIII, no. 1-2, 1996, 149-167.

These publications demonstrate the complexity of the issues involved and explain the need for a well-developed form of reasoning which is not limited by formal (binary) logic in order to do them intellectual justice.

3. Where do you think there may be a conflict between these two?

A conflict could arise if either side oversteps the limits implied by the definitions (1a,b), for instance if science claims "to read the mind of God", that is to "explain" fully the origin of the universe, or if religion claims to "explain" in detail and for all times *how* the universe was brought about.

4. What have been the grounds for the development of conflict between these two?

Conflict occurred primarily as a fight for power over people's minds and even lives. On the surface, it started with issues such as indicated in point (3) after it became clear that the new science (beginning in the Renaissance) had a much increased explanatory power due to new empirical observations and the application of mathematics, and it grew more autonomous.

5. What has been the role of religion in the development of science in the West?

From about Galileo's time (1562-1642) an important paradigm of scientists was that of God's "two books, Scripture and Nature". As a consequence, scientific research was in principle considered an expression of religiousness. In fact, for Johannes Kepler or Isaac Newton, doing research and studying sacred texts was all of one piece, a higher power could be discovered – however dimly – in either way. This was also facilitated by the belief that (a) the heavenly bodies were not divine, and hence it was all right to study them profanely, i.e. scientifically (not so, e.g., in ancient Egypt), and (b) the world was contingent, and hence needed to be studied empirically (not Plato's view, for whom only the eternal forms were "real", and hence worthy of serious study).

6. Can we have a religious science?

If I interpret the term correctly, the science of Kepler or Newton could have been called a religious science in as much as it was explicitly conceived as compatible with an Ultimate Reality (God), without, however, abandoning strict scientific standards in favour of purely religious assumptions.

7. Can science dispense with religion?

In my personal opinion, the answer is "No". As experience shows, human beings need a genuine higher authority which makes for distancing oneself from one's own-self so as to avoid self-adulation and hubris. The problem is to find a religious community (such as that of St. Francis) where such an attitude is practiced (as opposed to using religion for power games).

8. Can one separate the domains of activity of science and religion completely?

As indicated in point (1a,b), a conceptual separation is possible. Well-known is the case of Michael Faraday, who is said to have prayed in one location and researched in another, never mixing the two activities. There is also the view that science answers the question "How?", and religion the question "Why?", or that science deals with the natural and religion with the supernatural.

However, to my mind, it is more fruitful for either field if some interaction is admitted and practiced (cf. my publications listed under point 2). Beneficial roles of religion for science were already indicated in points (5) – increased motivation – and (7) – keeping science at a sufficiently high ethical level. Science can contribute to religion by (a) pointing out wonders of God's handiwork that do not meet the unprepared eye, and (b) evolving methods that could also be useful in religious studies and theology (e.g., carbon dating, text analyses by computer, etc.).

Rev. Prof. W. Mark Richardson

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Education: B.A. in history and political science (double major), University of Oregon; M. Div., Princeton Theological Seminary; Ph.D. The Graduate Theological Union, Berkeley, CA.

Professional Experience: Asst. Professor, Philosophical Theology, The Graduate Theological Union (GTU), 1991-1998, Assoc. Professor, Philosophical Theology, GTU, 1998-9; Assoc. Professor of Theology, The General Theological Seminary (GTS), New York, 1999-2001; Professor of Theology, GTS, 2001-present. Director of Program, The Center for Theology and the Natural Sciences, 1990-1994; Co-founder of The Science and Spiritual Quest Project, 1996-1998; Co-investigator of Science and Spiritual Quest II, 1999-2003.

Publications: Co-editor, *Science and the Spiritual Quest* (London: Routledge, 2002); Co-editor with Gordy Slack, *Faith in Science* (London: Routledge, 2001); Co-editor with Michael McLain, *Human and Divine Agency: Anglican, Catholic and Lutheran Perspectives* (Lanham: UPA, 1999); Co-editor, *Religion and Science: History, Method, and Dialogue* (NY: Routledge, 1996).

1. What is your definition of science and of religion?

Science is the study of the universe – all objects and states of affairs within it, including ourselves – involving systematic procedures for investigating the properties of phenomena, their structures, functions and processes. Science as a practice varies depending on the nature of the object under investigation, so it includes a multiplicity of methods. These are bound together by a common quest for universalize-able standards for what constitutes knowledge in scientific investigation.

As a human institution, religion is the practices, attitudes, actions, and overall bearing of life reflecting the ultimate concerns of human beings. It involves interpretation of reality at its largest scale, addressing questions of purpose, and the relation of self, other persons, and world to this purpose.

In monotheistic religious traditions, the whole of reality is not confined to the finite universe – described above as science's object – but rather concerns also a transcendent source and goal for the universe. The transcendent source is personal and relational. Thus, the practices, attitudes and actions within these traditions include worship, an attitude of reverence, humility, thanksgiving, moral aspirations fitting with the nature and goal of this transcendent reality, appreciation for beauty and truth as intimations of the divine source of, and presence in, the universe. The theistic traditions also involve a multiplicity of source for their understanding of truth, including insight from within the historical tradition received as revelation from God, and personal and community experience and interaction in the world. Finally, with respect to its claims, religion involves faith: trust in and loyalty to the source of all reality and value.

2. Do you see any conflict between your definitions of these two concepts?

I do not see religion and science as in a relationship of conflict, but rather as having a complementary relationship. For a monotheist, if the world the scientist explores is the same world the person of faith claims to be the creation of God, then science can in principle help to inform and refine the religious understanding of, and experience in, the world. Religion interprets the data of experience, including what is forthcoming from the sciences, in terms of its meaning and what it yields about divine intention and purpose. The scope of religion's concern is larger, more rounded, but with respect to knowledge it is not a finished product with packaged certainties. Given our finitude, and the dynamic conditions of nature and history, the religious person might best regard the *meaning*, even of that which it has received as revelation, as continuously unfolding.

3. Where do you think there may be a conflict between these two?

4. What have been the grounds for the development of conflict between these two?

Science and religion as institutions in our cultures run into conflict when the nature of the relation between them, and the domains of their concern, are misunderstood. Some scientists, at times, make "extra-scientific" claims with religious consequences, and pose these as direct entailments of the science itself. This false move can result in apparent conflict between science and religion. Religious leaders may confuse the source of religious authority with total intellectual authority over all knowledge about the world, thus falsely arbitrating standards of truth in science. These positions have been named "scientism" and "fundamentalism" respectively, and each has had extensive influence on popular cultures worldwide.

Science and religion may run into conflict in an indirect way as well, which does not reflect a necessary relation to either the science or the religion. Religions often become embedded in metaphysical systems which interpret the particular revelation of the tradition within the widest scope of reality.

On occasion the religion and the metaphysics seem fused so that it is difficult to conceive the religion without the specific metaphysical framework. Controversy continues, for example, about how the relation between monotheistic religions and Aristotelian metaphysics has contributed to religious understanding, and how it has falsely constrained it. Modern science, to use another example, has sometimes led to a cultural perspective that necessarily links the reductive method of scientific inquiry with a reductive physicalist interpretation of reality as a whole. The relation between science and religion in both cases is not direct, but mediated by commitments to frameworks of interpretation. In some cases, these frameworks can be an underlying source of conflict between science and religion.

5. What has been the role of religion in the development of science in the West?

I see Western monotheism as having a direct motivational and intellectual influence on the origins of Western science, even though the development of science has had an historical trajectory reflecting its own integrity, and independence from particular religions. Western monotheisms, by understanding the material universe as "creation", see it as invested with meaning by God. Indeed, the common creation story refers to nature in all its aspects as "good". The same "creation" perspective is of an ordered world, implied in the narration of its orderly unfolding in the first chapter of *Genesis*. The monotheistic traditions, generally, have held that all that exists is radically dependent on God's will as Creator.

The first of these points – creation's goodness and its origins in the source of goodness itself – motivates inquiry. The world is regarded as *worth knowing*. Its orderliness suggests that it is *knowable* – that systematic efforts, skilled observations and experimentation will reveal the nature of the universe. That this world results from free divine act, and involves God's continuous creativity, implies the possibility that surprise and contingency accompany order and law-likeness. Hence, empirical processes will be fundamental to inquiry into the nature of reality. Knowledge cannot rest on logical deductions from first principles alone. One can imagine how such ideas might form the motivational roots and background assumptions of modern science – assumptions about underlying patterns in nature that can be universalized, and about the fruitfulness of controlled and skilled observation. This kind of connection has been described elsewhere with much greater subtlety and detail by historians of theology and science. I view this interdependence at science's origins as illustrative of the continuous but indirect relation which always holds between science as a practice of disciplined inquiry, and the larger cultural frameworks which interprets the meaning of all knowledge and experience.

6. Can we have a religious science?

I suppose anything is possible, if that is what one means by this question. But I take it that what is really being asked is *should* there be religious science. In my opinion, it does not seem like a good thing to pursue. The history of religious pride suggests that religious authority over all human institutions can be abusive. The danger is present that, in the name of intellectual certainty stemming from faith, legitimate scientific inquiry could be falsely restrained, or shut down altogether. There would be a tendency to overstep the delicate relation between the practice of science and the interpretation of its results at various levels of reality. Science has thrived on open inquiry. It is, of course, dangerous to assume that it is a completely neutral activity. One should be cognizant of the fact that cultural and religious perspective has at least a background influence on the kinds of questions we ask, and the stance we hold toward the realities we investigate. Still, all things considered, we can anticipate science being most productive when its formal activity is not identified with any particular culture or religious influence, but rather achieves cross-cultural consent.

7. Can science dispense with religion?

This question is closely related to the one just above it. The expectation placed by the institution of science on its own activities is to participate in certain practices with disciplined rigor common to the scientific community, and with honesty in the quest for truth relative to one's inquiry. These are not expectations tied to a specific religion, though the same virtues of honesty and disciplined work take on particular meaning in religious traditions as well. The practical-empirical answer to the question is, yes, in fact science dispenses with religion. Its practitioners represent monotheism, non-theistic religions, naturalistic atheism, and virtually every religious stance one can name. Another kind of answer is to say that science operates at levels of reality and under kinds of constraint such that its results *underdetermine* the interpretative possibilities. In this sense, it involves practices which takes place "below the radar screen" of any particular religion tradition or direct identification with one. So, for example, a Christian does not need the results of a Christian in science, to find interpretation of the science which bears some relation to his or her faith. The same principle, I believe, extends to all other commitments on a religious scale, no matter what the tradition.

8. Can one separate the domains of activity of science and religion completely?

The variety of possible religious understandings and commitments among people who share so much in common as scientists is part of the story of science as an institution. Good science is done by atheists, agnostics, and those of deep faith in God. A range of views frequently open up once we interpret the work of any of them at the level of the human quest for meaning and spiritual fulfillment.

When systematic inquiry in any given field of natural knowledge takes us to the edge of that field, it often leads the inquirer to apprehensions beyond the discipline itself. The most popular example in physical cosmology is the breakdown of equations when one reaches singularity in the classical Big Bang theory. Once we have pushed back as far as we can toward the singularity, we finally face the question of cosmic origins, and the fundamental question, "Why is there something and not nothing?", which has occupied human imaginings since the dawn of civilization.

The above represents a point of interface, but the relationship, as I have already noted, extends further. What science can tell us affects the relative viability of various metaphysical, and sometimes religious, options. Conversely, our commitments on matters of ultimate concern dispose us toward the interpretations we make of the available scientific evidence. This is a peculiar situation – no necessary relationship, but real interdependence. In recent history, "chance" in nature signaled meaninglessness for philosopher of biology, Jacques Monod, while "chance" offers insight into the creative activity of God for bio-chemist and theologian, Arthur Peacocke. They were each interpreting the same kind of phenomena, but the science as such could not arbitrate their differences. Over the long term, we should expect one interpretation to fare better than the other. But, we live somewhere in between the worlds of "necessary entailment" relations between science and religion, on the one hand, and their complete independence, on the other hand.

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Education: University of Edinburgh, Ph.D., 1958 (in theology and religious studies); University of Pittsburgh, M.A., 1968 (in philosophy of science); Union Theological Seminary in Virginia, B.D., 1956; Davidson College, B.S., 1953 (in physics and mathematics).

Professional Experience: University Distinguished Professor, Colorado State University, 1992-present; Department of Philosophy, 1976-present.

Primary Research Interests: Philosophical, religious, and scientific conceptions of nature; relations between science and religion; biology and religion; environmental ethics; philosophy of biology.

Publications: *Genes, Genesis and God (Cambridge University Press, 1999) (Gifford Lectures); Science and Religion: A Critical Survey (Random House, McGraw Hill, Harcourt Brace); Philosophy Gone Wild (Prometheus Books); Environmental Ethics (Temple University Press); Conserving Natural Value (Columbia University Press); Three Big Bangs (Columbia University Press); A New Environmental Ethics: The Next Millennium for Life on Earth (Routledge); over two hundred professional articles in journals and books in over a dozen languages. Area editor for Environmental ethics, Encyclopedia of Bioethics, Edition II (Macmillan).*

Awards and Distinguished Lectures: Gifford Lectures, University of Edinburgh, 1997-1998; featured in Joy A. Palmer Cooper and David E. Cooper, eds., *Key Thinkers on the Environment* (London, Routledge, 2018); Doctor of Letters (D. Litt.), Davidson College, 2002; *Who's Who in the World; Who's Who in America*; invited lectures on seven continents; Templeton Prize in Religion (2003); University Distinguished Professor, Colorado State University.

1. What is your definition of science and of religion?

Science and religion share the conviction that the world is intelligible, but they define their quests differently. In the cleanest cases, we can say that science operates with the presumption that there are *causes* to things, religion with the presumption that there are *meanings* to things. Meanings and causes have in common a concept of order, but the type of order differs.

Typically in natural science *cause* is inferred from outward, empirically observable constant conjunctions, attended by an elusive notion of necessary production of consequent results by the preceding spatiotemporal events. Where causes are known, prediction is possible, and an effect is commonly thought explained if its causes are known, especially if it is subsumed under a covering law, that law giving a certain logic to the process.

Meaning is the perceived significance of something, typically with accompanying inwardness or subjective experience. Where meanings are methodically detected out of a covering model, which is thought to represent an ultimate structure in reality, one has some sort of religion or one of its metaphysical cousins. Science holds that causality runs deep in the nature of things; religion holds that what is highest in value runs deepest in the nature of things. It is often said that science answers *how* questions and religion answers *why* questions; but these words, while suggestive, are not reliable indicators of syntax and the kind of explanation sought.

Social scientists and psychologists are disagreed as to whether their sciences are ever sciences of meanings, and the puzzle as to how far human subjects can be causally understood has left the human sciences unsettled. The social sciences do not prescribe what meanings scientists themselves ought to have. Whenever one undertakes this latter task, one has passed over into the province of religion and its cognate fields – ethics, comparative religion, the humanities, philosophy.

2. Do you see any conflict between your definitions of these two concepts?

The search for causes does not *ipso facto* compete with the search for meanings, though discoveries and convictions in the one domain may and often does revise what we think in the other. Scientists have found many causal connections, while religious persons have discovered much of significance. These dispositions to interpret things causally and also meaningfully are built into the deep structures of the mind, and we have to some degree an innate psychological drive to find things intelligible.

There is vast diversity in religions, great diversity even within monotheisms; the sciences have a great diversity, from nuclear physics to sociology, which is almost equal to that in theism. Within such pluralism, some conflicts are to be expected between some forms of science and some forms of religion. Still, and despite the pluralism, these two great epistemic lines in the West are cousins, at once kindred and independent.

In a generalized way, science mixes observation, theory, and inference, but these ingredients with their blending are quite complex and differ with the sciences. As a first schematic, often called the hypothetico-deductive method, a scientist attempts to operate out of theory in an if-then mode "over" the facts. A theory (the hypothesis) is generated out of the facts, followed by deduction back down to further empirical-level expectations, those then being related back to observations to confirm or disconfirm the theory, more or less, and to generate revised theory. Such a theory comes to have a developmental history.

Such facts quickly become theory-laden. The scientist comes up with models and abstractions, such as lines of force in an electromagnetic field, concepts that come by mulling over the data, but in which the scientist also contributes creative hypotheses. With success, these interpretive frameworks can become increasingly dominant, what philosophy of science calls paradigms. Paradigms are governing models that, in some fairly broad range of experience, set the context of explanation and intelligibility.

Religion too methodically mixes experience, theory, and inference. There are many disanalogies, often one finds notions of revelation and inspiration, and hence of normative authority, that cannot be easily reconciled with the procedures of science. Creeds are not so provisional as scientific theories sometimes are, but more like settled operational assumptions (which scientific theories also can become). And there are many noncognitive elements in religion not present in science.

Nevertheless, in a general way religious convictions develop in the face of certain experiences judged to be of ultimate importance, as of suffering or of joy, of sin and salvation, of the holy and the moral. On reflection by theologians, there arise cognitive, theoretical notions suggesting certain universal spiritual laws or generalizations, leading to a positing of, and encounter with, an underlying ultimate reality in and beyond the world that is sufficient to account for such experiences. The later religious experience provides a testing of dogmas, confirming or disconfirming them. The history of religion is strewn with abandoned beliefs, largely overcome by more commanding creeds or made implausible by new ranges of experience. The basic idea of a controlling patterned seeing does seem to characterize the history of science and religion alike.

Scientists increasingly realize that theory, models, data, and description are more entwined than once supposed. This, together with discoveries in physics and shifting scientific theories over time, has softened the realism in science in favor of more historical and culture-bound accounts. Critics of science, especially the postmodernists, press these claims about the social construction of science and theology further than many scientists wish; and theologians are of mixed opinions whether to welcome these developments. Theology is evidently a cultural, historical activity; yet it too, like science, seems to make more universal and trans-cultural claims.

We cannot think without paradigms, and yet we hope to submit to the facts, do this what it may to our models. Just this willingness to set the compulsion of the truth above a compelling paradigm prevents the latter from becoming an ideology; it enables our paradigms, self-serving as they are, to be self-correcting. Honesty, truth, commitment, selflessness, and humility in the scientist facilitate the inception and teaching of science. Only devotion to truth can accomplish this; and so a willingness not only to give of oneself but to give up one's preconceptions and illusions for the sake of the truth – a determination to hear the whole truth and nothing but the truth, come what may, cost what it may – is as characteristic of good theology as it is of good science. The reforming spirit in theology is just this insistence that a person must not get in the way of the truth, must not bias it, but hear it sensitively and entirely.

3. Where do you think there may be a conflict between these two?

The conflicts between scientific and religious interpretations arise because the boundary between causality and meaning is semipermeable. The causal paradigm favors a computational logic, whether inductive or deductive, while the meaning paradigm involves an intelligibility that is more holistic. Causes go into linear networks, which often permit a quantifying theoretical overlay measuring with numbers. Even nonmetric science is prone to analysis, involving, for instance, taxonomic serial catalogs and phylogenetic chains, bringing a particular occurrence or individual under a covering law or type.

Science needs repeatability and parallelism.

Religious meanings are not integrative in this scalar way. When set in their gestalt, the particulars give rise to meaning. In detecting more sophisticated patterns, as with recognizing faces, there is a subtle interplay of textural features by which the whole is constituted. This sort of logic can be present in science but it looms much larger as one approaches the perception of meanings. One must join earlier and later significances in ways more qualitative than quantitative, more dramatic than linear. The sense of scenic scope is more crucial than that of incremental detail, hence the nonmetric character of religion. Religion is historical and this may involve unique particulars, such as for Christians the life and death of Jesus, or for Muslims the giving of the Qur'an.

The relations between physics and theology are surprisingly cordial at present; the relations between biology and theology are more difficult. Astrophysics and nuclear physics, combining quantum mechanics and relativity theory, are describing a universe "fine-tuned" for life, while evolutionary and molecular biology seem to be discovering that the history of life is a random walk with much struggle and chance.

Molecular biology, discovering DNA, has decoded the "secret of life" (once ascribed to the Spirit of God). Evolutionary history has located the secret of life in natural selection operating over incremental variations across enormous time spans, with the fittest selected to survive. The process is prolific, but evolutionary history can seem tinkering and make-shift at the same time that, within structural constraints and mutations available, it optimizes adapted fit.

Natural selection is thought to be blind, both in the genetic variations bubbling up without regard to the needs of the organism, some few of which by chance are beneficial, and also in the evolutionary selective forces, which select for survival, without regard to advance. Evolutionary science often carries an implicit or explicit understanding of who and what humans are, one which may not be coherent with the human self-understandings that come with religious education. Humans may well need religious teachings for their salvation, perhaps even to be humane in their cultures, for religion can enlighten and elevate the human nature that has evolved biologically.

Though dominant throughout biology, evolutionary theory has proved quite problematic itself (independently of any theological agenda). There are disagreements involving the relative degrees of order and contingency, repeatability, predictability, the role of sexuality, competition and symbiosis, the evolutionary origins of mind, especially the human mind, differences between nature and culture. Darwinian natural history reveals an ambiguity in life, often problematic. Life is a ceaseless struggle; new life is generated by blasting the old. Darwinians may focus on the survival of the fittest, accentuating the competition in life, "nature red in tooth and claw". Darwin as well portrays connectedness in life, common ancestry, survival of the best adapted, life support in ecosystems, life persisting in the midst of its perpetual perishing, life generated and regenerated in spectacular biodiversity and complexity, with exuberance displayed over three and a half billion years, an "abundance of life".

Such a view of life echoes ancient religious motifs: Life is a table prepared in the midst of enemies, green pastures in the valley of the shadow of death. An evolutionary theism emphasizes the continuing vital creative processes over time, the ascent of life from the simple to the complex, the increase of information, the effective and efficient results of genetic creativity and natural selection, producing a quasi-design, the production of more out of less over long millennia, with the increasing sophistication of molecular structures. A plausible account is that creaturely autonomy and self-creativity is combined with the divine will for life.

4. What have been the grounds for the development of conflict between these two?

The warfare between science and theology is often a struggle to clarify to what extent causal explanations are compatible with or antagonistic to meaning explanations. Particular disputes may result in adjusted claims about the territory occupied by each account. While no one denies that each field commands some territory of its own and that there is partial complementarity, are they always commensurable? Some kinds of causal accounts, for example, the competitive survival of the fittest, do seem to inhibit some kinds of meaning accounts, such as that every species was divinely designed at an initial, sudden creation. Some causal explanations show some meaning explanations to be inaccurate, inadequate, or irrelevant. Science, by redescribing nature, places constraints on what concepts of God are credible, even though science by this redescription prescribes nothing about God's existence. It sets limits within which meaning accounts can work.

Does the presence of sacred meanings in the world require any tearing in the weft of causes and effects, any perforation of the natural by a supernatural order? Does the meaning account sometimes constrain the causal, as when the experience of autonomy and moral responsibility seems to demand that persons be something more than effects predetermined by antecedent causes and stimuli? Experience that is counted puzzling under the causal framework may prove intelligible under the meaning framework.

Religion asks about good and evil, about guilt and redemption, about love, justice, and holiness, about the values of the subject in its objective world, and it judges these to be the ultimate or deepest ranges of experience, beside which the empirical explanations of the sciences are penultimate or even superficial. In the natural processes that the physical and biological sciences investigate, most of these issues do not ordinarily appear. So far as they do, as for instance when an evolutionist asks whether the elimination of the less fit is bad, the question cannot be solved with those tools with which the scientist does her empirical work.

On any occasions where prescriptions are offered, some values must be superadded to empirical data, and science has moved over to the participatory level of religion. Reformatory elements begin to appear, and in religion reformation of the person is a primary goal. To what world view does it seem most worthwhile and reasonable to give my allegiance? Here science has a way of truth; religion is a way of truth. In science, one knows "about" the object; religion removes that "about" to know with more intimacy. Here the judge must be up to what she judges; that is, the character conditions are more demanding. Moral experience is required in the counselor, a sense of justice of the judge. Spiritual qualification is required of the theologian, involving talent at levels not demanded of the physicist qua physicist. Only the pure in heart can see God.

Every discipline requires its relevant sensitivity; and learning and thinking in the biophysical and social sciences, so far as they operate empirically, are simpler morally, aesthetically, and spiritually, however complex a causal logic may be used, than these are in religion. Proportionately as truths become more significant, combining cosmic with personal importance, they require more sensitivity for their reception. One cannot verify merely by painstaking observation or imaginative construction what has been discovered and confirmed by passion, sacrifice, faith, and suffering. This relative restriction of science to empirical levels and to descriptive, technical logic partly explains why, among those competent to judge, there can be broader intersubjective agreement in science than in religion. Sometimes it even seems that the elusiveness of an answer is in proportion to the importance of the question!

5.What has been the role of religion in the development of science in the West?

The Hebrews disenchanted the universe on the basis of monotheism long before science appeared, a conviction that carried forward to Christianity and to Islam. The belief that the world was the good creation of a rational, just, and loving God subsequently made science possible. Here also the Greeks helped. Their gods became incredible, even before the monotheist expansions, and the Greek bent toward rational analysis complemented the Hebrew beliefs in their one God creating a good world.

Would-be scientists have to get rational theory and empirical observation in the right mix, and Judeo-Christian-Islamic monotheism introduced the proper amount of each. The natural world, rational by virtue of the Creator who made it, is also contingent. The world order is by free creation, not by necessity. Humans must discover the laws of the cosmos by consulting it. On the one hand, humans cannot know how the world works a priori (rationalism, mathematics); on the other hand, mere a posteriori observational data (empiricism) is also insufficient. A monotheist cosmology orients thinkers to a moderate realism, and science results.

These monotheist origins of science must be faced by the many scientists who think of themselves as secular, or those who think of science and religion as feuding camps, or unrelated disciplines. They also have to be faced in Asia, in Africa and elsewhere where science was so often stillborn. Science was the logical evolution of the monotheist belief that the universe was the rational product of the Creator and that humans are destined to become the masters and possessors of nature – for however problematic the latter belief has become in an environmental age, it did serve to generate and legitimate the historical development of science.

Even after science was launched, it has not been easy to keep these ingredients properly blended. Too much empiricism has too little faith in the creative intellect; it passively accepts phenomena as given and fails actively to think that the scientist can re-think God's rational thoughts after him. Too much idealism loses its way in a priori system building; it fails regularly to consult the created world. Scientists display real creative genius when convinced of the intelligibility of a nature that can be contingently discovered, as for example in Newton in classical science, or in the twentieth century, by Albert Einstein.

6. Can we have a religious science?

This question admits no simple answer, for there are several questions embedded within it. As just argued, the science that we do have in the West comes trailing religious origins. On the other hand, there is no Christian physics, biology, or geology differing from Islamic or from secular physics, biology, or geology. And I postpone until the next the question whether contemporary science and scientists will be operating out of metaphysical frameworks that have religious implications. Christian, or Muslim, or secular value commitments may drive differing research agendas in the sciences. Whether, for example, scientists devote their limited time, energy, and resources to producing weapons, or to medicine, or to research toward a sustainable world, will depend on their deepest value commitments.

Interpreted another way, this question could also ask whether theology is a science, a religious science. The answer most synthetically speaking is *yes*, but more analytically speaking is *no*. Theology, like science, is, as claimed above, broadly a systematic attempt at understanding and so might be called a science. Nevertheless, more specifically, as also claimed above, science focuses on causal understandings while theology focuses on meanings; on balance, it is best not to try to claim theology as a science. This is also true of other humanities, such as history, literature, or politics. The better course is to realize the incompleteness of science, to which I next turn.

7. Can science dispense with religion?

Particular sciences in their search for causes do not need religious claims about meanings. But the larger metaphysical frameworks within which scientists operate, will raise religious questions. Science can dispense with religion, but scientists cannot – or at least not without something in the room of religion to make their lives, and their careers in the sciences, worthwhile. Scientists need meaning in life as much as anybody else; they too must choose between good and evil.

One distinctive characteristic of human life is its broken-ness, and here the religions classically offer "salvation", or "the good life". "I have set before you, life and death, blessing and curse; therefore choose life" (Deuteronomy, 30:19). Jesus says: "I am the way, the truth, and the life". The metaphor may be of new life; one is born again, or regenerated. This reforming of life appears to many philosophers, ethicists, and theologians to be the area in which the sciences have so little purchase – the *ought to be* – however much physics has found the ultimate constituents of matter and the origins of the cosmos. Biology has decoded what *is* describing the metabolisms and evolution of life, or perhaps (in a currently fashionable metaphor) found "selfish genes" that dispose our behavior. But to reason from what *is* as a result of evolution to what *ought to be* is to commit the naturalistic fallacy.

Now the theologians, especially after having heard from physicists that the universe is "fine-tuned" for life, will resist the claims that biology explains religion, finding the secret of life in genes or in natural section, or finding that religion is (nothing but) some mythical belief system that favors survival. Theologians turn the tables. Rather, religion is needed to explain biology, that is, the prolific genesis of life on Earth, documented in natural history, generates religious responses. The prolific Earthen fertility, or generative capacity, in which we find ourselves immersed, is what most needs to be explained. We humans alone confront the ethical duty of appropriate respect for such life, including our own human life. Nothing in biology settles questions about the meaning of life.

8. Can one separate the domains of activity of science and religion completely?

Classical theism, though once medieval, has nowhere become modern without dramatic revisions. Science is not, as is sometimes thought, merely instrumental to value, for intrinsic science does redescribe the world for us. The descriptions here cannot be ignored, for such discoveries as the age and extent of the universe, the evolution of life and its biochemical nature, the human neurophysiological structures, or the electronic character of matter have forced theology to reform earlier accounts of meanings. Persons always shape their values in some correspondence with what they believe the world to be actually like.

But these descriptions never constitute prescriptions, however much they may force a reconstituting of them. In this sense, religion is fully operational, completely functional in joining theory with practice, as science is not. Religion has its own value setup, which permits the translation of principles into conduct, while any scientific system is parasitic on some value system before it can become operational in life. Religion, however, is not so operational that it can ignore what science reveals about the character of the world and of life.

An older form of this claim is that science seeks knowledge, but the spiritual quest is for wisdom. Knowledge and wisdom are neither coextensive nor mutually exclusive, but they overlap. In part, but only in part, a person remains naive and unwise until she has integrated the best available knowledge from the current sciences into her worldview. Still, such knowledge is not sufficient for wisdom, for no accumulation of causal explanations can ever produce the significance of a thing. The latter comes at another level of insight. In this sense, science *explains* but religion *reveals*; science *informs*, but religion *reforms*.

Meanings are always self-implicating. Values are by definition those things that make a difference. This might be thought to bias a person's capacities for logic in religion. One cannot think clearly about what one is wrapped up in. But the other side of this is that one will not think at all about that for which one does not care, or rightly think about that for which one does not rightly care. This caring becomes more self-reforming as the inquiry passes from the scientific to the religious. The task of religion is to examine that self in its relationships with the world, unmasking illusions and false cares, reforming it from self-centeredness, centering it on that which is of ultimate worth.

Religion shares with science then a concern for objective rationality, only it knows far better than science that the path to true objectivity lies through subjective reformation. Religion is the science of the spirit, where a rationality suited for objects is inadequate. Here reflective scientists will not say that they come to nature without assumptions, despising theologians as being overcome with them. But they will see that, so far as their selection employs empirical causation as their fishing net, they have a different set of assumptions; and they may even wonder whether just these assumptions might prevent them from receiving the data of religion in an undistorted form.

Theologians will claim that, with due admiration for its successes, science leaves the ultimate value questions still urgent and unresolved. Indeed, there is no scientific guidance of life; despite the evident progress in the sciences in today's world, the value questions remain as acute and painful as ever.

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Post-Doctoral Professional Experience: Visiting Research Fellow at High Altitude Observatory, NCAR, Boulder (Co), USA- 1972. Visiting Research Fellow at ISSI (International Space Science Institute), Bern, Switzerland (2011, 2013, 2015 and 2016). 1989, Full Professor (Astrophysics), Nice University. Emeritus since 2012. Chairman of the Development Council of the Grasse Agglomeration (France) since 2016. CEO of the French Society of Engineers since 2020.

Current areas of Research: Theoretical studies on the internal rotation of the Sun; alternative theories of Relativity; historical research on the solar oblateness; co-investigator on SDO (Solar Dynamics Observatory), NASA satellite. Discoverer of the solar leptocline.

Publications: Over 380 scientific papers. Author of 11 books on Astrophysics (Springer ed.)

Awards: Elected Member (non-resident) of the Accademia Gioenia of Natural Sciences, Catania (I) -2008. Asteroid 31174 named after him.

1. What is your definition of science and religion?

Science is the set of knowledge, which, at a given time in our history that uniformly is flowing, allows us to have the most accurate and true vision of all the facts in which man is bathed. Science is all that can be codified, for example in the form of laws, which are verifiable because everyone can reproduce them. Thus, at a given date, the known laws of physics define the physical sciences, while the whole demonstrable set of theorems defines the mathematical sciences. And so on, the social sciences themselves will first dutifully define their fields of study in order to draw human behaviors and attitudes that will then be applied in the most universal possible way. Science is a body of verified knowledge, on which everyone agrees at the date of his writing. By contrast, the scientific research will be ensuring the progresses in science. Science is not frozen; it is on its basis that we will rely on whether a discovery, born from scientific research, will be able to enrich it, or not. Thus, Ohm's law was universal until it was discovered that it no more worked at low temperatures and a new form of the law was introduced.

Religion is a set of explicit and/or coherent facts that have its roots in the explanation of the world around us, or to be a little bit more solemn, in the explanation of the universe. It defines man's relationship with the sacred, the latter being the domain that must inspire fear and respect, as opposed to the profane domain. Religion is a corpus of deeds, practiced by all those who adhere and are visible in the open.

A particular religion is defined by the community-specific elements of those who share this religion (believers): sacred books, dogmas, ritual practices, cults, sacraments, moral requirements, prohibitions, organization, etc. Most of the religions have been developed from a revelation based on the exemplary history of a people, a prophet or a sage who taught an ideal of life.

Science is based on the reality of facts; it does not reflect an opinion: the sentence beginning by "I feel that ..." has no place here. Opinion is an arbitrary and subjective assertion based on a vague sense of reality, without a scientific basis. Religion is based on a long tradition; it takes place in broad daylight, unlike sects, whose practices and behaviors remain obscure, disturbing and sometimes harmful.

From a philosophical point of view, one could say that science and religion have a common starting point: the explanation of the world around us.

Science should not be confused with scientific research. This latter renders possible science progress. Following a strictly scientific approach, no additional or multifactorial event to what has been already acted, can be attributed to any of the factors, even for the dominant one. Stricto sensu, a scientist can only have a probabilistic approach.

Religion is progressing only under the authority of doctors of the Law, who are the only ones empowered to interpret the different currents derived from sacred origins and codify practices. This is especially true for the Abrahamic religions (Islamism, Judaism and Christianism), although for Hinduism, Brahmins have an important knowledge about the world, until they become Pandit, the most glorious title that a Brahmin can have because of his broad philosophical, scientific or artistic culture. Under no circumstances can a probabilistic conception of these religions be accepted.

2. Do you see any conflict between your definitions of these two concepts?

I do not see any conflict between these two definitions.

Science allows man to conduct himself in the world. In doing so, he uses techniques derived from science, without necessarily either adhering to or understanding the scientific knowledge that enabled him to discover and implement them. You can use television without knowing how it works and without knowing the laws which are hidden behind (optical laws, various algorithms, etc.). You can live perfectly without knowing anything about quantum mechanics. One can live perfectly without knowing the set built in the positioning of urban landscapes in a geography of space. In France, for example, it is a good thing to say that we know nothing about mathematics. This does not prevent you from really living your life.

Religion, too, allows you to conduct yourself in the world, but following the precepts it has installed and which are transcribed into a set of a set of moral, ethical and conduct codes. One cannot live without reference to virtuous principles, all of which are heirs to religious facts. I have never understood that someone says that he is living as an atheist, since he will follow, de facto, principles derived from religious reality, whether they may come from Hindu issues (e.g. deny the illusory form of the "individual self"), Koranic (e.g. render alms) or Judeo-Christian (e.g. you will not kill). Unless you wish to live in anomie, i.e. a situation of social disorder, without laws, without rules, where disputes are settled only by physical violence (armed or not), in a complete dissolution of social norms, rules, laws and customs. But this is no longer living in society.

3. Where do you think that there may have been a conflict between the two?

Conflict is inevitable when everyone, the scientist who believes in science and in it alone, and the religious who believes in his religion and in it alone, remains on its position. So, it's a matter of belief; everyone is convinced that their vision is the only one acceptable and that people must adhere without any other possible outcomes. That kind of attitude is sterile.

However, a scientific discovery may be problematic for some religions, but without consequence for others. One scientific theme may threaten religious opinions, while another will be perceived as innocuous. For example, scientific questions about the development of biology may offend Christians; on the other hand, the development of mathematics is indifferent to them.

Since the 19th century, mistrust between science and religion settled and still has persisted throughout the twentieth. Under pressure from agnostic scientists, "science" became the absolute umbrella, and religion was supposed to disappear. This is less true since the beginning of the twentieth century with scientific breakthroughs that raise questions. Thus, the Higgs boson provides mass to elementary particles, but why do they have mass? The more one advances in a precise knowledge of a scientific fact, the more the limit of it recedes. Thus, the anthropogenic principle formulated by Brandon Carter in 1974, in its weak form or in its strong form, questions both the observer (we observe the universe because the conditions are required for our presence, otherwise we would not be there to observe) and the fundamental parameters of the universe (these are set incredibly fine to allow the birth and development of observers at some stage of its development). But who made the "adjustments,"?

4. What have been the grounds for the development of conflict between these two?

To my mind, it is a matter of knowledge and power. More and more scientists believe that only science is legitimate. What is not science, in the sense of the definition given in (§1) is then occult or a matter of superstition. One could say, like lawyers, that science today is gradually becoming as a dominant position. But it is not the abuse of science that is dangerous; it is the abuse of technical advances from science. Power, essentially the economic one, uses the latest technical inventions and political power follows. I do not know to date politicians who have decided by themselves to develop new scientific themes (by the way would that be their role?). In this context, religion is then relegated to a so-called intimate belief space. Except in the rare cases where it is the pillar of political power. But then science is relegated to its space of pure knowledge. The foundations of the conflict are therefore between knowledge and power.

5.What has been the role of religion in the development of science in the West?

It depends greatly according on the time and place. I would limit myself to the example of religious buildings. Even if in this case, it may be more an issue of technique than science, and an issue of sacred more than religion, although in each case the former proceeds from the latter. The Greeks put their knowledge into building beautiful temples dedicated to their cults. Albeit temples were not essential to worship, since worship only requires a delimited sacred space (the "temeros"). The temple, when there is one, is built within the boundaries of the temenos. The Greek temples orientation was most often determined by astronomical considerations, with the Greeks probably borrowing this symbolism from Egyptian shrines. However, their constructions have given rise to architectural masterpieces such as the Hephaestion of Athens or the Temple of Asclepios in Pergamon. For the latter, the closed part of the temple (the "naos" that housed the statue of the deity, was no less than 23.5 meters long, which was considerable for the time. It was surmounted by a dome, which required advanced scientific knowledge. Asclepios was a meeting place for philosophers and doctors. These places have been the source of considerable scientific advances. Consider Pytahogore and his group of religious intent (whose kind of life is dominated by asceticism and purifications), which enabled both the emergence of musical ranges and astronomy. Think of Euclid who synthesized the scientific knowledge at the time (optics and geometry) in a monumental treatise. This vast work, based on rigorous definitions and set out in a logical order, will be commented on and transmitted in the West. The first printed edition dates as back as 1482 and will be until 1900 the most published book after the Bible.

Similarly, the Arabs wanted to glorify divine power by building structures in which they used their mathematical genius, either by the purity of straight lines (minarets) or curved ones (domes). From my point of view, bulb domes are the magnificent expression of mathematical art in the service of the sacred (not to mention technique, in the service of God, e.g. the installation of colored mosaics, see the Blue Mosque of Isfahan). The same is true for cathedrals. Let's have a look at the magnificence of Milan Cathedral, a festival of stone lace. Architects, sculptors and artists have contributed to the glory of God. Science is underlying, because it is not possible to build without knowing geometry, and not possible to build without rules or compasses.

This game between science and religion (limited here to buildings) continues today. The Cathedral of Evry (France) wants to give a heart and an identity to a new city in the Paris suburbs. Circular, and no longer in the shape of a cross, the building shakes up the traditional image of the cathedral, so that man is seized by light, by the purity of lines, by the beauty and simplicity of materials, bricks, wood, glass. The new Orthodox Cathedral in Paris uses modern composite materials from the latest advances in mechanical science for its five traditional bulb bell towers. The Great Qaboos Mosque in Muscat favors the alliance of modernity and tradition. The five minarets echo the five pillars of Islam. The stained-glass windows, because of their size, use the most innovative techniques derived from research on glass and lead.

From a general point of view, science, through its discoveries, has been able to mark civilization, in the broadest sense (not just a civilization, because all civilizations - Chinese, Indian, Brazilian ... borrow from science these days). Thus, the images reported by space astronomy feed human thought as to its place in the Universe

6. Can we have a religious science?

We should have from a non-theological perspective. What is needed is a real teaching of religious sciences, from a philological, linguistic, historical, literary point of view... using exegesis, sociology, anthropology, archaeology, etc., in their scientific aspects. Theological essence should be reserved in a specific, distinct teaching. The historiographical approach of religions is not reducible to a collection, as vast as possible, of successive monographs devoted to different religions: this is not the purpose of the history of religions. On the contrary, it is appropriate to apply to a conception that is based on the comparable religious facts that are part of the different cultures, which are then studied through a comparative scientific approach.

The history of religions is not just about how they were born, how they developed, how they eventually died. It must show what differentiates them, in a scientific approach. How the cults followed one another, how the new ones took over the old ones, how they were transformed. This comparative history, if it can show cuts, in no way shows the definitive halt of the mystical impulses that have passed through the history of mankind.

7. Can science dispense with religion?

From my point of view, that is not desirable. Historically, science has often not been able to move forward without religion. As an example, to verify a religious fact that scientists have looked as a particular issue. The most famous example is that of Galileo, even if the fact is indirect. Science can sometimes provide answers to the questions raised by religious traditions. This is the case of Ulugh Begh, an "ocean of wisdom and science" whose reputation as an astronomer is well established, and who wanted to reconcile « knowledge of scientific truths and philosophical subtleties, so that with the help of God helping and lenient, and following this maxim "that he who painfully seeks a thing finds it", the poor author was able to explain with security, using the pen of intelligence and reflection, the obscurities of science and above all philosophy, which is not subject to the dust of the vicissitudes of sects, nor to the differences in languages according to the times ».

Then and paradoxically, science cannot move forward without religion. The more we look towards the "Big Bang", the more we advance in the knowledge of the first hours, then that of the minutes, then that of the seconds, thus approaching the very early creation date of the universe. But beyond that, how did the primordial spark come about? We are we tempted to say "who"? Digitus Dei est in hic? Let's see the Michelangelo fresco painted on the Sistine chapel ceiling: the Creation of Adam, portraying the creation of mankind by God, at his image. If we express, as some cosmologists think, that the world was created during the reversal of a quantum fluctuation that was spreading in an infinitely empty and infinitely flat universe, then it is indeed an image that has come, like that obtained in the mirror of the universe.

8. Can one separate the domains of activity of science and religion completely?

That would be theoretically possible. But then society would go wrong. Man needs both legs to move forward; otherwise, he walks in a wobbly way. Society needs science and religion to move forward. To separate the two domains is to lock them each in a narrow straitjacket. If science is aimed exclusively at the knowledge of the truth or reality of the object in question, as already seen, then on must admit, if one separates them, that the religion object has a distinct scientific reality. In this case, can religions then survive our scientific/technological society? They could do so because they provide an identity, and seek to make sense of events, to interpret the universe, not necessarily to understand it. The error would be then to believe that religion would be a failed attempt to explain the world.

Finally, to the extent that religion cannot remain purely internal and since it manifests itself in varying forms of externality, every State should know how to give a legal approach. For example, and elementally, every State should proclaim freedom of religion if it differs from freedom of conviction. The legal forms of science are translated into ethical laws, which are not so far removed from the rules and conduct set out by religions.

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Post-Doctoral Professional Experience: Senior Lecturer, then Principal Lecturer, in organic chemistry at Harris College, Preston (now University of Central Lancashire) (1970-72); Senior Lecturer (1970-72), Reader (1972-81), then Professor in History of Science and Technology (1981-93), the Open University. Since then, Emeritus Professor at the Open University and now also Affiliated Research Scholar at the University of Cambridge. Visiting Fellow (1884-85), and now Senior Member, Wolfson College, Cambridge. Chairman, Historical Group of the Royal Society of Chemistry (1977-81); Council Member, Royal Society of Chemistry (1999-2002); President, British Society for the History of Science (1986-88); Chairman (1988-94), President (1994-2001) and now Vice-President, Christians in Science.

Primary Research Fields: organic chemistry; history of chemistry; history of science and religion; environmental history.

Publications: Author, co-author or editor of 19 books, including *Cross-currents: Interactions between Science and Faith* (London: Institute of Contemporary Christianity, rev. ed. 1995) and *The Earth, Humanity and* God, 1994 (London: University College London Press). Author also of 65 major papers and several hundred shorter articles.

Awards: Dexter Award from the American Chemical Society ("for outstanding contributions to the history of chemistry"), 1990; David Mellor Medal from University of New South Wales, 1995.

1. What is your definition of science and of religion?

I define science as the systematic exploration of the natural world by means of experiment and observation. This leads, by a variety of routes, to the establishment of regularities known as scientific laws, and the creation of generalized hypotheses or theories in which underlying explanations of these regularities are sought.

In a general sense, I understand religion as the whole experience of humanity, cognitive and affective, involving ultimate issues and values in both the material and supra-material worlds. However, religion can be more simply understood as men's search for a Supreme Being known to all the monotheistic faiths as God. In the case of the Biblical religions (Judaism and especially Christianity), it is better understood as meaning God's search for man.

2. Do you see any conflict between your definitions of these two concepts?

None whatever.

3. Where do you think there may be a conflict between these two?

Science and religion may appear to be in conflict when either one steps beyond its proper role. For example, scientists may take upon themselves questions of *morality* which involve values quite outside the scientific process. They may – and should – hold opinions in such areas, but they are not speaking in the name of science when they express them. Some scientific people deny *miracles* (either contemporary or otherwise), but such events, if they occur, are quite outside the sphere of science. By definition, scientific laws are about things that normally happen, while, also by definition, miracle is always an exception to the norm. Hence, to deny miracle in the name of science is to argue in a circle. In the case of the New Testament miracles as the resurrection of Jesus Christ, the question of evidence inevitably arises. But it is historical, not scientific, evidence that is relevant. The use of historical data and methodology has led many to hold that the resurrection is "the best attested fact in history". As an utterly unique event, it clearly partakes of the nature of miracle, and as such is beyond the ability of science either to refute or confirm. The manner of proof always depends on the nature of the proposition being tested.

Religionists frequently transgress into the region of science when, for example, they argue from Scripture about whether the earth goes round the sun, whether evolution is tenable, the age of the earth, the extent of the Flood of Noah, etc. Their arguments rest on the assumption that Scripture is intended to teach science, a fallacy exposed as long ago as Augustine. This became abundantly clear in the disputes by Galileo and others concerning the Copernican model of the solar system, but the lessons were sadly not learned by the later movement that styles itself "creationism". In fact, Darwin and Copernicus invited exactly the same kind of question: Is the Bible to be read a textbook of science?

4. What have been the grounds for the development of conflict between these two?

The notion that conflict is the norm between science and religion has been so popularized that it has almost become a standard picture of the relationship between them. It usually includes the additional assumption that such conflict is inevitably one-sided, with science always becoming victorious. Of course, the controversies associated with Galileo and Darwin lend some credibility to the idea that they may be merely the most dramatic examples of a universal tendency to conflict between science and religion. If that is the case, there should be plenty of historical evidence in its support. In fact, however, scholars today nearly universally agree that the "conflict thesis" is simply untrue. Despite attempts by a few writers to show otherwise their efforts are now rightly dismissed as propaganda rather than serious history, for each had his special axe to grind. The overwhelming weight of evidence points to a quite different kind of relationship, such as harmony, dependence, symbiosis, etc.

There are many reasons for the persistence of this "conflict thesis". People still see advantages in a story of perpetual warfare. On one side, atheists and philosophical materialists are committed to discrediting all kinds of religion and anxious to give every impression that the defeat of religion is only a matter of time. At the other extreme, those holding a literalist interpretation of Scripture actually want to offer an alternative view of earth and human history. Their case would collapse if a conflict with science did not exist (though they would not share their opponents' expectation that science would win). There has been a carefully orchestrated campaign to persuade us that conflict is usual and inevitable. This dates from a determined effort in the

19th century by Huxley and his friends to make the "conflict thesis" part of popular cultural belief. They were outstandingly successful. More recently, their efforts have been reinforced by those of certain people in the media who see that a "conflict" story makes much more interesting television than one in which all parties are largely agreed. And so the legends are repeated time and time again, each time gaining a little more dramatic colour and so subtly transforming the myth into a body of received belief.

5. What has been the role of religion in the development of science in the West?

The role of religion in the development of science in the West has been immense. The gifts from Islam of Arabic mathematics and chemistry have left a legacy not only of words (*alembic, algebra, alchemy,* etc.) but also of techniques (like distillation), substances (from gum Arabic to the mineral acids) and astronomical data. In "Christian" Europe the church's attitude to natural knowledge was at best ambivalent until the Renaissance and Reformation. The contributions of Jews to early science, particularly to alchemy, have been described; though how far their work reflected their theology is perhaps less clear than in the case of Islam. With the rediscovery of the Christian Scriptures as a possession of the common people came also a realization that the Bible had much to say about the Christian's attitude to nature. If "the heavens declare the glory of God", it will be right to examine them more closely, and if the Creator is truly interested in the wild-life mentioned at the end of the book of Job then to learn about them will give a truer understanding of the relation between man, nature and God. Indeed, the development of natural theology owed much to Biblical theology: God may be inferred, as well as understood, from His works in nature. Moreover, humanity will benefit from a heightened understanding of nature.

All of this, and much else, may be found in the writings of Francis Bacon. At the same time, the concept of scientific law became firmly established, a corollary, it seems, of men's greater awareness of an omnipotent Lawgiver. A further Baconian emphasis was the priority of relying on experiment rather than received tradition. This was a radical departure, with the mediaeval devotion to Greek authorities and intellectual speculation being replaced by manual and often dirty operations of experiment. The only books now relevant were "the book of God's word [the Bible] and the book of God's works [Nature]". Again, the Biblical emphasis on the createdness of nature and the virtue of hard work were in strong contrast to the Greek antipathy for manual labour, fit only for the slaves.

The importance of this change of mindset is incalculable, only eclipsed by one other transformation. This was in the fundamental ways of viewing the universe. Throughout mediaeval times, the world around us had been habitually conceived as being either divine or at least animate, views that are commonly called pantheist or organismic respectively. One of the greatest of all shifts in human thought came when such views were replaced by one that was best described as mechanistic. Here, the fierce monotheism of Old and New Testaments left no room at all for pantheism, and there was little encouragement for an animistic view. So, at the hands of Boyle and many other members of the early Royal Society, the world was seen as a vast interlocking mechanism, like a great clock, fashioned by the Creator for His glory and our good. Every fresh discovery of science gave further evidence of a great design, reflected the glory of the Creator and offered new possibilities for the benefit of humanity.

Many of these movements took place in England, where the Protestant Reformation was the underlying force. In those parts of Europe dominated by the ideas of Luther and Calvin, similar developments took place, especially in Holland, Germany and Sweden. It would, however, be oversimplistic to claim, as some have done, that science is uniquely indebted to this form of Christianity. In France, particularly, the dominant religion of Roman Catholicism did not seem to inhibit science as had happened with Galileo, and may well have influenced it though in more gentle and less visible ways than in Protestant countries. And it must never be forgotten that the event that started it all, the Copernican Revolution, began in Catholic Poland, though that was in the more tolerant days before the Counter Reformation and with strong links between Copernicus and the liberal form of German Catholicism associated with Erasmus.

Since those halcyon days of the "Scientific Revolution", the visible dependence of science on religion has lessened. Science has now developed an independence of its own and no longer needs to be spurred on so much by religion. But the numbers of leading scientists who profess an active form of Christianity, even to our own day, cannot be ignored. If, as the promoters of a New Age philosophy hope, an organismic universe replaces the mechanistic one, the age of science may well come to an end. Much seems to depend on how all the great monotheistic religions respond to that challenge.

6. Can we have a religious science?

I would wish to distinguish "a religious science" from "a religious scientist". History and contemporary experience amply demonstrate the possibility of the latter. But that which is truly science has to be universal and its findings acceptable to those of any faith or none. There is therefore no such thing as an Islamic physics or a Christian chemistry, for example. Nevertheless, there are at least three ways in which the borderline between science and religion is fuzzy, and in which religion may influence the progress of science. In the first place, science can be "Christian", "Judaist" or "Islamic" in the sense that it owes its inspiration to those world religions. This is supremely obvious in the case of the Scientific Revolution. Secondly, there may be cases where ethical insights derived from religion may define boundaries to scientific enquiry. In the Middle Ages, the [Roman] Catholic church proscribed alchemy, partly because of its perceived dishonesty. Much more recently, various Christian groups have declined to sanction research in nuclear energy and genetic engineering. Whether their arguments are sound is not the point. The fact remains that some religious people felt ethical objections apparently derived from their theology. Thirdly, the application of science in technology has often brought about damage to the environment, and numerous Christian groups in Europe and America have objected to this on the theological ground that nature is a creation to be respected and maintained. We live on God's earth, not ours.

Despite the above reservations, it remains broadly true that there is now no such thing as s "religious science".

7. Can science dispense with religion?

Science can dispense with religion – and has largely done so – in a practical and formal sense. What is easily forgotten is that the *underlying assumptions* of science are largely derived from religion. This is not just a matter of history. It is also a question of logic and philosophy. Thus science proceeds on the basis that the universe makes sense, but there is no *a priori* reason at all why this should be so, unless one concedes that this is how God has made it. Science also assumes regularities, laws, etc., and there is no reason for doing so except the pragmatic one that the assumption usually works and the theological one that God is a God of order. Science has, so far, prospered most when it has rejected pantheistic or animistic views of the universe.

These are excluded by a theology which sees nature as the work of a creator who makes and controls it. And so one could go on.

8. Can one separate the domains of activity of science and religion completely?

I hope that I have shown that such separation is usual in practice. However, in matters of motivation, underlying assumptions, ethical constraints, and ontological views of the universe, such separation is artificial. And at a personal level, it is always possible for well-formed theological ideas to co-exist with the best attitudes of science. One person may be deeply religious and an effective scientist at the same time. That is the clear result of the best historical approach, well attested by contemporary experience.

Prof. Robert John Russell

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Principal Books: Founding Co-Editor, *Theology and Science* (2003 – present); *Time in Eternity: Pannenberg, Physics and Eschatology in Mutual Interaction* (Notre Dame: University of Notre Dame, anticipated 2012); *Cosmology from Alpha to Omega: Theology and Science in Creative Mutual Interaction (Collected Writings in Theology and Science 1982-2007)*, (Minneapolis: Fortress Press, 2008); *Physics and Cosmology: Scientific Perspectives on the Problem of Natural Evil*, Nancey Murphy, Robert John Russell, and William R. Stoeger, S. J., eds. (Notre Dame: University of Notre Dame Press, 2007); *Fifty Years in Science and Religion: Ian G. Barbour and His Legacy*, Robert John Russell, ed. (Ashgate Publications: 2004); Principle Editor, seven volumes in theology and science on *Scientific Perspectives on Divine Action* (Notre Dame: University of Notre Dame Press, 1991 – 2002); *Physics, Philosophy and Theology: A Common Quest for Understanding*, Robert John Russell, William Stoeger, S. J., and George Coyne, S.J., eds. (Vatican City State: Vatican Observatory, 1988), translated into Arabic and Spanish.

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1. What is your definition of science and religion?

My definition of the relation between science and religion comes primarily from the typology offered several decades ago by Ian G. Barbour, one of the pioneers in the field. According to Barbour the relation is basically fourfold: conflict, independence, dialogue, and integration (*Religion in an Age of Science*, 1990). I support the latter two for a variety of reasons.

First, however, I want to clarify my use of terms here. Rather than focusing on "religion" I focus on "theology" as the self-critical, second-order discourse arising from a religious community's sustained and rational inquiry into the meaning of the sources (such as sacred text) and ongoing experiences (such as worship) of that community. Theological topics thus include God/ultimacy/emptyness, creation/co-dependent origination, providence/divine action/divine causality/occasionalism, human nature/non-self, sin/karma, natural evil/suffering, redemption and eschatology/nirvana as they arise in the world religions, particularly the Abrahamic traditions of Judaism, Christianity and Islam but also the religions of Asia, India, and Iran, etc.. Similarly by "science" I tend to mean the major discoveries and theories of the scientific community, such as Big Bang cosmology, relativity and quantum mechanics, evolutionary and molecular biology, genetics, the cognitive and neurosciences, and so on. It is these two fields and their interactions that I will discuss here.

Under "dialogue" I am particularly appreciative of the comparison of methods in science and in theology. Here Nancey Murphy in particular has made an excellent contribution in urging that theologians try using methods drawn from the philosophy of science, such as that of Imre Lakatos. Philip Hefner used Lakatosian methodology in his book-length theological work on human nature, Philip Clayton and Murphy have responded to each other regarding Lakatos, and I have used Lakatos in writings on cosmology and creation, and on other topics.

Under "integration" I have found Barbour's approach called "theology of nature" especially helpful in describing how theologians critically appropriate the sweeping theories of the natural sciences within their constructive project of addressing theological topics. I think many, perhaps most, of us working in theology and science can be seen as undertaking a theology of nature while some explore a revised form of natural theology such as Barbour includes in his "integration" approach. The writings of scholars who seek to use evidence of "fine tuning" in cosmology for a contemporary form of the design argument lie within Barbour's category of natural theology. John Polkinghorne's illuminating writings in general fall within both of these approaches while the writings of Celia Deane-Drummond, Noah Efrom, Medhi Golshani, Niels Gregersen, Daniel Matt, Arthur Peacocke, Ted Peters, V. V. Raman, Norbert Samuelson, LeRon Shults, Trinh Xuan Thuan, Michael Welker, Joseph Zycinski, and others seem to me to be more clearly focused on a theology of nature. While Barbour himself can be seen to be pursuing a theology of nature, I think it's clear that his main contributions have been within what he calls "systematic synthesis." Here one takes up a major philosophical system and uses it as a creative framework for integrating theology and science. For neo-Thomists like John Haught, Bill Stoeger and Denis Edwards, the philosophical system is that of Aristotle as appropriated by Thomas Aquinas and modified in light of Kant. For Barbour the philosophical system of choice is a lucid combination of Whitehead and Hartshorne, resulting in Barbour's massive proposals for a theology that aggressively engages the sciences systematically, comprehensively and creatively.

While I am appreciative of Barbour's theology of nature, I would like to add to it the possibility that theology might also serve as a reservoir of potent ideas about nature that scientists might find attractive. I have therefore developed an interactive approach which first asks theologians to reformulate their work in light of science (following Barbour's theology of nature) and then to offer suggestions for the kinds of research programs within science towards which such a reformulated theology might point. I call this method the "creative mutual interaction" between theology and science ("CMI"). It is based on mutual respect, open dialogue and a serious commitment to sustained research among interested theologians and scientists. I have given this method a book-length treatment in *Time in Eternity: Pannenberg, Physics and Eschatology in Creative Mutual Interaction* (2012). I believe this method has a unique potential of making theology and science more fully interactive.

2. Do you see any conflict between your definitions of these two concepts?

If I define science by its knowledge of the facts and fundamental laws of nature gained through the empirical method and theology by its knowledge of and encounter with the holy gained by the sustained, self-critical and rational reflection of a worshiping community on its sacred scripture and lived experience, then clearly these two modes of knowledge are quite different. Conflict, however, arises when certain defenders of science claim that science alone offers us true knowledge of reality ("scientism") and when advocates of religion similarly adopt a literal and unilaterally authoritative interpretation of sacred scripture. Instead of these extremes, I view science as an incredibly productive method of inquiry into the facts and fundamental laws of nature which has no cognitive jurisdiction over the questions of theology (particularly the existence of God). Similarly I view theology as a life-orienting method of inquiry into the depths of religious experience, including our sacred texts, councils and creeds, and our living experience of the divine / ultimacy. It takes its sources (including scripture, tradition, reason and experience) as normative but it does not interpret them literally. It is a method which can learn much about its ultimate concern from the discoveries of science even while its primary sources are elsewhere, but it is a method which has no jurisdiction over science, its methods and the status of its theories.

3.Where do you think that there may have been a conflict between the two?

As suggested above, conflict has arisen when either mode of knowledge, scientific or theological, has been given not only normative value in what we know about the world (science) and how we conduct our lives (religion) but when the holy texts of religion and the theories of science are treated literally and not just normatively. So, for example, when Christians treat Genesis 1 as a scientific account of the creation of the world and biological life, they certainly run into conflict with contemporary scientific accounts of the evolution of species. But when we realize that the Genesis account was written in light of the cosmology of Babylon, where the Jews had been in exile, and when we honor and celebrate that it is a statement of continuing faith in God proclaimed within the structures of knowledge of the best of their times --- namely Babylonian cosmology --- then should we feel obliged to do the same with contemporary science: proclaim our faith in God in terms of the cosmology, cosmogony and evolutionary biology of the 20th and 21st century. As Augustine is well known to have said, the Bible tells us how to go to heaven; it does not tell us how the heavens go!

4. What have been the grounds for the development of conflict between these two?

I want to stress, if I may, the extent of the harmony between science and theology over the past two to three centuries. Certainly we all know about the occasional conflicts which erupted, such as that between the church and Galileo. But the fact is that many scientists who played a leading role in the development of physics and biology over these years were highly religious. Names include Sir Issac Newton, James Clerk Maxwell, Gregor Mendel, but there are many, many others whom scholars in the history of science, and more recently in the history of science and religion, are highlighting, including the writings of John Brooke, David Lindberg and Ronald Numbers.

5. What has been the role of religion in the development of science in the West?

Historians have made an increasingly compelling case that the religious views of distinguished scientists, such as Sir Issac Newton and James Clerk Maxwell, have played a key role in the development of modern science. Newton is a well-known case: In order for classical mechanics to be successful, Newton had to postulate the existence of what he called absolute space and absolute time. These factors separated out accelerating systems from those in truly uniform motion in ordinary space and time, and this was essential if Newton was to apply his most basic proposal, that force produces an acceleration on masses, to physical systems in nature according to the famous equation f=ma, where f is the applied force, a the acceleration, and m the mass of the accelerated particle. To explain what constitutes absolute space and time, Newton appealed to God who sensed the world through absolute space and time. God's omnipresence, in turn, accounted for the specific distribution of real physical states in nature and secured the classical motion of the planets. Similarly histories can be given of the creative role of religious experience and beliefs in the lives of many prominent scientists over the past centuries.

6. Can we have a religious science?

I doubt it, if by "religious science" one means a specific version of science that is based on a particular religion and distinct from another such version of science based on a different religion. In my view, the theories of science are based on methodological naturalism: the project of science is to discover how much we can explain the empirical facts about the world in terms of natural causes. This in no way excludes other kinds of causes, whether we call them divine causes, supernatural causes, etc.. It just means we will not invoke them within the limits of a scientific explanation of nature. So science neither directly supports metaphysical theism nor metaphysical naturalism / atheism, nor does it rule out either of them.

Because of this we are free to interpret the theories of science within any particular religious tradition. So participants in the three Abrahamic traditions --- Jews, Christians and Muslims --- have every right to interpret the leading scientific theories --- cosmology, relativity, quantum physics, evolutionary and molecular biology, and so on --- in light of their traditions. The result will be a Muslim view of evolution or a Jewish view of cosmology, and so on. It is then the respectful and open dialogue between these views and others like them that has been so pivotal in contributing to real progress in "science and religion" over the past decades, progress taking us away from conflict into genuine inter-religious discovery and mutual appreciation.

7. Can science dispense with religion?

Pace folks like Richard Dawkins and Daniel Dennett, science as such cannot dispense with religion nor can science directly support --- or undercut --- metaphysical naturalism / atheism, metaphysical theism (as in the Abrahamic traditions), or metaphysical non-theism (as in Asian religions). In fact one can view science and religion in a more interactive model. Let us take "religion" to include not only "organized religion," with its sacred texts, places and forms of worship, etc., but all those elements of ultimate significance in human life and society. Paul Tillich was famous for arguing that religion is the shape of culture, seen in the things that count the most to society --- be they such noble goals as freedom and justice or such mundane strivings such as wealth and fame. Culture, in turn, is the substance of religion, the personal and social 'stuff' whose shape displays the actual, functioning values of a given society regardless of the words used in political and social contexts. We can apply this insight to the science / religion domain and say that while the substance of science is its theories --- Big Bang cosmology, evolutionary biology, etc. --- the religious 'shape' of science is its thirst for a Theory of Everything, the ultimate origin and destiny of the universe, the fundamental laws of nature, laws by which some scientists like Paul Davies claim we can read the mind of God. In fact far from dispensing with religion, the practice of science can be a form of religiosity and spirituality when the search for scientific discovery becomes a quest for understanding humanity's ultimate place and significance in the cosmos. Many scientists in CTNS's "Science and the Spiritual Quest" program were compelling advocates for this understanding of science, including many of those found in this book, including its editor Medhi Golshani.

8. Can one separate the domains of activity of science and religion completely?

In a practical sense, yes, scientific research and religious worship are routinely separated by the day of the week or the hour of the day. But in a more fundamental sense, no. The actual activity of science - designing new equipment, taking and analyzing measurements, framing and testing competing theories - all involve metaphysical and aesthetic assumptions that have deep roots in a religious attitude towards nature and which function in the construction of new scientifric theories and the choice between competing theories.

Thus even as science discovers new knowledge about nature it makes these discoveries by first making a priori assumptions about nature in order to shape its theories and interpret its empirical evidence. What is matter? How is it related causality? What are space and time and their relations? How do complex physical and biological systems emerge in time from simpler ones? Answers to these and many other scientific questions come from the theories tested empirically by scientists, but assumptions about these answers already are at work in the construction of new theories and in the design and implementation of new experiments to test them.

Aesthetic criteria are equally at work here. Einstein was famous for saying that General Relativity had to be correct because it was "too beautiful" not to be true. And the famous "Occam's Razor" --- the best theory is the simplest one --- is at heart an aesthetic principle about the importance of simplicity both in our theories and in nature herself. Similarly there are empirical elements as well as aesthetic principles in religion. When theists affirm their faith in God the Creator, they are referring both to the ever-transcendent source of the mystery of existence and to the concrete fact of existence in all its empirical, earthy character. When Muslims, Jews and

Christians pray that God's will be done, they are referring to situations in their lives, in society, in the world, empirical conditions some of which can be advanced with joy, others of which must be prophetically challenged and dismantled.

Religion is suffused with an understanding of the world which science both directly and indirectly affects, and science is layered on top of assumptions about the nature she studies which has deeply theistic roots --- that empirical data count for what we believe to be true stems out of the monotheistic belief that the world can only be known by exploring it since it is the free and unfettered creation of an absolutely sovereign God. For these and many more reasons the activities of science and religion cannot be completely separated even though on a practical level they are routinely treated independently even by the most ardent religious persons.

Prof. Dr. Muhammad Shamsher Ali

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Education: Ph.D in Theoretical Nuclear Physics (University of Manchester, UK, 1965). M.Sc (Dhaka University,1960)

Post Graduate Experiences: Work on Alpha-Alpha potential has deep significance in Astrophysics ; Director of Atomic Energy Centre at Dhaka(1970-1978);Professor of Physics(Dhaka University;1982-2006);Founder & Vice-Chancellor of Bangladesh Open University(1992-1996);Founder & Vice-Chancellor of Southesat University(2002-2010) President of ,Bangladesh Academy of Sciences (2004-2012) ; Fellow of The Third World Academy Of Sciences(TWAS),Islamic World Academy of Science(IAS) and Bangladesh Academy of Sciences(BAS); Fellow of Bangla Academy ,the most prestigious Cultural Organisation of Bangladesh ;Vice-President ,AASSA(Association of Academics of Sciences and Societies in Asia),2014-2016

Publications: A large number of research publications in Nuclear and Hypernuclear Physics in Journals of International Repute

Conducted more than 300 programs on Science ,Science and Religion issues., etc.(visit www.mshamsherali.com)

Books: Co-authored two books on Islam: (1)*Scientific Indications in the Holy Quran*,1990 (2)*Muslim Contributions to Science and Technology*,1996 ; Authored other books in English including Islam, *Science and Culture*,2016,Kothamela Prokashona,Dhaka (2)*Islam and some contemporary Issues*,2016 Somacha.

1. What is your definition of science and religion?

Science, in my opinion is a systematic study, through observation and experiments, of the structure, working and properties of all living and non-living objects in the universe, and also a study of the elementary particles and their mutual interactions which operates within these objects

Religion is a matter of faith in and worship of a unique super power which controls all things through some laws which humans can explore and some other laws which may be beyond the reach of the human ken. Religion also provides a code of living for the peace and prosperity for all human beings

2. Do you see any conflict between your definitions of these two concepts?

Since we are defining two different concepts, there should not be any conflicts between the two definitions. Science and religion have their own spheres of working, although there is an overlap between the two, the area of overlap being the investigation of truths in nature. Religion encourages the seeking of truths and science does it in its own way. In the religion of Islam, which has a deep Abrahamic link with Judaism and Christianity. It is said in the Holy Quran in Verse! 0:101

"Ask them to pay attention to everything that exists between the Heavens and the Earth...".

But paying attention to everything (the smallest of the small and the biggest of the big) between the Heavens and the Earth is exactly the agenda of science. Thus, religion has encouraged queries and investigations that are very central to the pursuit of science. The agenda of religion, although include the agenda of science is, however, wider. The principles of love, sympathy and fellow –feelings, services to the created beings, and the principle of altruism are embedded in the agenda of religion but not in the agenda of science.

3. Where do you think that there may have been a conflict between the two?

The conflict between science and religion, especially in the west, may have been due to an erroneous impression created in the minds of the intellectuals that science and religion cannot go together. This impression got a firm ground out of a conflict between the Church and the scientific community, centering on the issue of planetary motion (to be explained later).In Islam, such a conflict did not arise because science and religion were not regarded as disparate in the matter of establishment of truth .In Surah Rum(Verse 30:22),scientific phenomena, like the creation of the heavens and the earth, and change of colour and language , have been described as matters in which there are signs for the *Aalimeen*(plural of the word *Aalim* which means someone who has '*ilm*') Incidentally, unless otherwise specified, the word '*ilm*'' stands for science. Since in the present verse (30:22), the matters mentioned are purely of a scientific nature, it can be inferred that Allah has termed a scientist as an *Aalim*. The word '*Aalim*' became one of the titles for a knowledgeable person in the hierarchy of degrees of the Madrasah system of education. Incidentally, in Islam, *ilm* or knowledge had always been dealt with in a holistic approach. Long before the word 'Scientist' was coined in 1834 by a Cambridge University historian and philosopher of science William Whewell, *Aalims* of Madrasas In Tunis, Morocco, Baghad, and in observatories at Nishapour, Samarghand (Ulug Beg) Maragah and during the period 8th-15th century were preparing Zijes(Astronomical Tables) and Astrolabes for the determination of altitude and azimuth of heavenly bodies. Then, *Alims* like Ulug Beg, Tusi, Al-Khawarizmi, Ibne Sina(Avicenna) ,Ibn al-Haytham ,and a host of others , were acting more actively than the present day scientists. Not only that. following the holistic spirit of culturing knowledge, the same *Aalim* was a poet, a mathematician, an astronomer, etc. They studied religious and secular sciences together. There was no hindrance from any quarter in their pursuit of knowledge. The present *Aalims* tend to specialize more in Islamic sciences and not in secular sciences like physics, chemistry, mathematics, etc., and obviously they do not and cannot look into the heavens even with an ordinary telescope, not to speak of using a radio telescope. Are they *Aalims*, then, in the sense that Allah meant in verse 30:22 of the Holy Quran?

Almost a couple of hundred years later, some new *Aalims* like Nicolas Copernicus and Galileo Galilei made their appearance felt in Poland and Italy respectively .Copernicus was a loyal catholic; Galileo was also a catholic and believed in God .Being a believer in the uses of science and in the fascinating beauty of God's creation, Galileo said: "I do not feel obliged to believe that the same God who has endowed us with sense, reason and intellect has intended us to forego their use." Galileo did use his intellect and supported the heliocentric theory of the motion of planets instead of the geocentric theory which had prevailed for some time. This angered the Roman Catholic Church, who took a hostile attitude towards the supporters of the geocentric theory. But in the Islamic world, Ibn Al Shatir, who was a contemporary of Copernicus, thought otherwise, and some historians of science think that his work on the heliocentric theory of motion should have been available for Copernicus. Anyway, a conflict ensued between the church and science which left deep wounds on the minds of free thinking individuals and created a shift away from religion for a large number of people.

4.what have been the grounds for the development of conflict between the two?

There have been some reasons for this conflict, but the main one has been the long battle between the Roman Catholic Church and the cultivators of science(This was the term used for scientist before the word scientist was coined much later).It all started when in the year 1543, Nicholas Copernicus from Cracow, in Poland, published in De Revolutionbus an astronomical model wherein he showed that the sun is at the centre of our solar system and all planets of the solar system, including the earth, revolve round the sun. This is the heliocentric theory of planetary motion. This came as a great bolt to the authority of Roman Catholic Church , which along with many of its Christian followers, believed till the middle of the sixteenth century and even beyond, that everything, including the sun, rotate around the earth. The church, holding Biblical Ideas, believed in the geocentric theory of motion of heavenly bodies so strongly that people were really afraid of saying anything against it. Not only the church, but even Ptolemy, a mathematician and astronomer, believed that the earth is at the centre of the universe, and in his famous work Almagesti, he presented his flawed theory, working out geometrically, that the planets move in epycycles, smaller circles, and the earth itself moved along an equant.

However, another believer in God and a greater seeker of truth, Galileo Galilei of Italy, lent strong support to the heliocentric theory of Copernicus. The basis of his support was his observations of the solar system, using the telescope that he painstakingly made himself. Galileo saw that like the phases of the moon, the phase of Venus also changes and that it keeps revolving. The Roman Catholic Church became unnerved at this observation of Galileo and accused this believer in God of heresy. Galileo was kept under house arrest, and in the year 1616, the Church subjected Galileo to the strictest possible interrogation, which, in history, is known as the inquisition of Galileo. Finally, Galileo fearing torture and death fell on his knees and was forced to admit that he was wrong. Never before in history was such an insulting behavior meted out to a seeker of truth. It was nevertheless comforting to know that few of the last words of Galileo were: "But the earth moves". This was one of the causes of Renaissance. People started believing in the spirit of Renaissance, that man using his intellect, skills, and reason could acquire an infinite potential for living and reasoning things out. It was a kind of rediscovery of man by himself, so to say. The young and progressive people to whom Renaissance mattered most, were utterly dismayed at the behavior of the Church towards truth seekers, and gradually moved away from the main stream of religion, as if religion itself was against the awakening of man. Unfortunately, the heydays of the Muslim Scholars, whose deep intellectual work over centuries contributed to the ushering of Renaissance, were over. It is a pity that no Muslim scholars could point out to the western people of that time that the concept of orbits in which the heavenly bodies are moving is already there in the Quran (Verse 36:40 which says: 'each swims in its own orbit'. With repeated observations through telescopes and data, the nature of the orbits and the laws of motion can be determined as was done by Johannes Kepler.in fact ,the idea of orbits and the pattern of motion of the heavenly bodies was indicated in the Holy Quran more than 1400years ago before any astronomical observatory sprang up; the earth and its moon rotate about themselves and around the sun, the sun rotates around its axis and about a central axis of the galaxy; the galaxies are also moving; nothing is at rest; everything is in motion .Motion is the order of the universe .The Muslim researchers did not have any major problem reconciling their astronomical observation with the Quran. It is presumably due to the fact that in the Quran itself, it is stated in Verse 14:19 "have you not seen that Allah has created the heavens and the earth in truth?" This truth has always been made manifest by scientists, the truth seeking *Aalims*.

It is a great pity that even after the after the Foucault Pendulam experiment of 1851, which conclusively demonstrated the rotation of the earth, the Church did not express a word of sorrow or regret (within my knowledge) for its unjust stand against the scientific scholars. After a long time, the Pope of Vatican came out with a pronouncement, a few years ago, that 'The Church was wrong'. This statement, although being late, is to be saluted.

There have been disagreements between the church and the scientific community about applications of science which have great social implications. One broad area of discord is the theory of evolution through natural selection. Apart from the issue of missing links between man and ape, there are still arguments for and against the theory even among the working scientists themselves .not to speak of the uninformed public. Francis Collins writes, in his book titled "The Language of God", that the theory of evolution should not pose any problem to belief in God.

Areas of discord have been also over transplanting of body parts, abortions, human clonings, etc. But interestingly, the stand of the Church on these matters has found support from a large section of the members of the public, simply because of the moral and ethical issues involved. The church has also taken its stand against homosexuality and gay marriages, but unfortunately the law giving authorities of many governments have legalized these, possibly keeping an eye on the "vote issue'. To conclude, the conflicts between religious and scientific communities have areas of dissension alright, but not beyond the possibilities for reconciliation.

5.What has been the role of religion in the development of science in the West?

We can discuss the role of religion in the development of science in terms of contributions of ancient Pagan, Muslim and Christian scholars. Although pagans lived in nature far from the world of observations and measurements, they were nature revering and had traditional health practices based on herbs. There are not very many books which give a description of the indigenous knowledge built in their life styles. What we call the foundations of modern science were hardly there. Thus, we turn to the times of Muslim and Christian scholars when the scientific method was established. That religion played a great and historical role in the development of science in the west is evident from the systematic scientific researches of the Islamic scholars during a span of almost eight centuries. John William Draper claims in the 'history of the Intellectual development in Europe' that "Renaissance owes its birth to Islam'. He also points out unequivocally that: "Not one of the purely mathematical mixed or practical sciences was omitted by the Arabs". Robert Briffault goes a step further and declares:" science is the most momentous contribution of Arab civilization to the modern world.

The debt of our science to the Arabs does not consist in startling discoveries of revolutionary theories----science owes a great deal more to the Arab culture----it owes its existence". Pandit Jawaharlul Nehru, the first Prime minister of India, testifies to this claim in his book titled 'Glimpses of World History' and declares: "among the ancients, we do not find the scientific method in Egypt or in China or in India. We find just a little bit of it in old Greece. In Rome again, it was absent. But the Arabs had this scientific spirit of enquiry, and so they may be considered the fathers of Modern Science".

In the words of Rev. Bosworth-Smith in 'Mohammad and Mohammedanism', "during the darkest period of European history, for five hundred years, Muslims ..held up the torch of learning to humanity".

An account of the ground breaking work of Islamic scientists can be found in the History of Science volumes written by George Sarton. As I said earlier, renaissance would not have taken place in Europe without the illuminating work performed by the Islamic scholars. In astronomy, mathematics, physics, chemistry ,geography, medical science etc, pioneering work was done by the Islamic scientists. Ibn al Shatir was the precursor of the Heliocentric theory of planetary motion (which is now accredited to Copernicus, who also was a monumental supporter of the Heliocentic theory) ,the work of Al Battani in trigonometry, the discovery of the Pendulum by Ibn Yunus,the discovery of Algebra by Al Khawarizmi (the word algebra coming from the Arabic root Al-Jabr, meaning the reunion of broken parts), the naming of 'Algorithms'(which is the key word in the world of computer science) after the name of Al Khawarizmi, Ibn al Haytham's theory of vision in Optics and the introduction of 'Lens' from his work[ibn al Haytham wrote that the eye looks like 'Adasa' ,an Arabic word meaning convex shaped red coloured Lentil. When this knowledge was passed to Europe, western scientists understood that Adasa is botanically called Lenticum. From Lenticum based on Adasa, came the word Lens. Ibn al Haytham's discovery of the famous optical law[sin 'i'/ sin'r'=i/r for small angles was later called Snell's Law, the observation of the rectilinear propagation of light by Al-Kindi, ibn Sina's Monumental work in Medicine ,Ibn Nafis's theory of the circulation of blood, Jabir Ibn Hayyan's celebrated work in Chemistry(the very word chemistry derives its name from Arabic Al-Chimia),the introduction of zero'0 '(Sifr) and its extensive uses, Omar Khayam's work on the Cubic equation, the uses of MuslimZigges(atronomical tables)by Western Astronomers and finally ,the introduction of the only a few illustrations of the Islamic contribution to the development of the present day scientific civilization .

The scientific contributions made by the Islamic Scholars became a property more of the west rather than of any other part of the world. This is because the scientists of the west had all the will and capability to build on what the Muslim scientist had left behind as the Commonwealth of Mankind. For historic reasons, there had been a lull in the surge of Islamic Science. It is only recently that Muslim boys and girls have been imbued with the spirit of science and technology and are keeping their contributions in the West, although on a limited scale. In this process of revival, they have been greatly encouraged and stimulated by the great Physicist Abdus Salam who along with Steven Weinberg and Sheldon Glashow won the Nobel Prize in 1979 for their contributions to the theory of the unified weak and electromagnetic interactions between elementary particles. Salam always thought that his research was a part of his Islamic faith; he created a superb International Centre for Theoretical Physicist at Trieste ,Italy, the country of Galileo, for scientific collaboration between scientists of the East with those of the West .Nobel Prize winner in femto chemistry late Prof Zohail(from Egypt, the land of religion and civilization) who worked in the West for quite sometime also acts as a source of inspiration for young researchers.

During and after the Renaissance, Christianity has played an important part in patronizing science. The catholic Church had its own university which produced many scientists of distinction. The Galileo affair apart, the church became supportive of science. The Vatican Council Declared (1869/70) that 'Faith and reason are of mutual help of each other'. This was a very welcome declaration conducive to the growth of science. Had this decision come earlier, many of the conflicts between the Church and Science could have been avoided. Nevertheless, many of the epoch making scientists of the world had been either priests of the Church or were known as Catholic Scientists. A few typical examples are: Catholic Priest Nicolas Copernicus(1473-1543) who presented Heliocentrism ;Friar George Mendel(1822-!884) who pioneered Genetics;(Incidentally many biological works of great interest were performed by Catholic Scientists);Geoge Lamaitre(1894-1966) of the Belgian Church, who was an illustrious scientist and proposed the Big Bang Theory of the Creation of the Universe; famous Catholic physicist and astronomer Galileo Galilei(1564-1642), Roger Bacon(1220-1292) who was influenced by the work of Avicenna and Ibn al-Haytham and like the latter he also insisted on experimental scientific work ,even in confirming his Christian Faith(Incidentally he was elected to

Papacy); famous catholic physicist and astronomer Galileo Galilei(1564-1642); Jean Baptiste Lamarck(1744-1829) who pre figured the theory of evolution and not only believed in God bur regarded God as the Sublime Author of Nature; Antonio Lavoisier(1748-1895) who pioneered modern chemistry and discovered oxygen, carbon, nitrogen and silicon: Louis Pasteur (1822-1895) whose work in bacteriology saved many lives: Rene Descarte(1596-1650) who was a devout Catholic and father of Cartesian Geometry(although in 1963 the Church put Descarte's work on the index of forbidden works), and many others in the present times.

Jews also played a significant part in the development of science in the West. But Jews were not in the scientific mainstream until the modern era. They were late in coming; but when they came, they came in large numbers , with excellence in many areas of current interest. Just like Muslims and Christians, the Jews understood that the religious books were a warrant to understand the Universe. In this connection, it is worthwhile recollecting a statement of a wise Jewish Philosopher of Cordova, Moses Maimonides (1138-1204), who said: Science is one of the routes to the love and fear of God.

An interesting fact about Jewish scientists is that out of more than 900 Nobel Laureates, twenty percent of those have been Jews, although the Jewish population comprises less than 0.2 percent of the world population. It is difficult to enumerate all the Nobel prizes of the Jewish people or to evaluate the faith levels of their scientists. But it is interesting to quote the opinion of the most celebrated Physicist Albert Einstein about science and religion which is known to many: science without religion is lame; religion without science is blind. This philosophy of co-existence of science and religion brought science to its state of development as we see it today.

The Hindu religion has also been a greater promoter of Biddya (Learning) and some of the followers of Hindu religion have started contributing to the international pool of scientific knowledge. Mention may be made here of Srinivasan Ramanujan (1887-1920) one of the greatest number theorists that the world ever produced. He did stay in the West for a very short time working with the famous mathematician Thomas Hardy. He was a deeply devoted Hindu. He once said" An equation for me has no meaning unless it expresses a thought of God."

To summarize, the role of religion in the development of science in the West has been varied and spread over a very long period of time.

6. Can we have a religious science?

I am nor very favourably inclined towards having a religious science. My apprehension is that once such a subject is introduced, it may turn out that its syllabus would be more and more oriented in course of time towards ritualistic aspects. 'Rituals' are a part of religion alright but a substantial part of it is 'conduct'. One of the important ingredients of this is conduct is the culture of knowledge in general and science in particular. I am afraid religious science may not address this issue properly. Science and religion may be a better topic to deal with, although it is quite a hackneyed one. But here at least, you can raise the moral and ethical issues of mankind and then find out how science can be of use in settling those issues. Also, the importance of the study of science as laid down in Quran and Sunnah and in other revealed Books on religion can be communicated to the members of the public. The idea would be to study ethical and scientific topics of the day simultaneously.

7. Can Science dispense with religion?

In my opinion, science cannot dispense with religion. Usually, one thing can dispense with another (in the sense of getting rid of) when they are completely unrelated to each other. This is not so in the case of religion and science. A great overlap between science and religion consists in the area of "truth seeking". Science does the truth-seeking only in its own limited way. The Books of religion ask man to do the truth seeking also but they ask people to love each other, to do righteous deeds and take care of other life forms in the spirit of an eco-philosophy. This caring of other life forms is an area where religion meets science in the area of preservation of bio-diversity which is at the very root of our existence. Religion points to scientific facts. Science analyses those facts and tries to find out the significance of those facts. An example can make this point clear: In the Quran ,it is mentioned that there is fear and hope in lightning and thundering .A scientist can understand the first part alright regarding fear, as lightning can kill people; but to understand the second part(hope) he has to do some research and find out that during lightning, at high temperature nitrous oxide is converted into nitric acid which falls on the ground and forms nitrates which are absorbed by plants as fertilizers. This fertilizer formation through lightning is actually the 'hope', mentioned in the Quran. Incidentally, though there is 78% nitrogen in air, plants cannot take this nitrogen from the air; herein lies the wisdom of the religious Books. These Books are not Books of Science. Scientific facts are mentioned only as Signs of the Creator.it is the scientists' duty to investigate into those facts along with their other investigations of nature

Furthermore, when the scientists discover something new, it is the duty of knowledgeable religious people to advise the scientists on the application of these discoveries, and scientists should listen to such advice lest such applications disturb the various members of the biotic world. Thus, science and religion should work together in a spirit of co-operation and appreciation. The issue of science dispensing with religion is not an appropriate one.

8. Can one separate the domains of activity of science and religion completely?

The answer to this question depends on whether the two domains of science and religion are completely independent of each other or not. The answer would also depend on whether or not all scientists would deny God and all religious people do not care about science at all. The reality is, however, quite different. People have known about astronomers Nicolas Copernicus , Galileo Galilei and Georges Lemaitre ; bacteriologist Louis Pasteur; geneticist George Mendel; theoretical Physicists Abdus Salam and theoretical physicist John Polkinghorne ;Makers of Quantum Mechanics ,Max Planck and Werner Heisenberg ;Physicists Newton and Maxwell; and numerous hard core scientists have believed in God and have been very faithful to their scientific professions. Not only that, for some scientists, science has been a strengthening of their faith, as has been evident from a short statement of Sir Ghillean Prance:" All my studies in science ......have confirmed my Faith". Then there is the other side of the picture. There are scientists like Richard Dawkins who not only do not believe in God, but have been waging a relentless battle against God. What Richard Dawkins should appreciate is that many of the present day scientists who believe in God are of a really high caliber. In this connection, I am reminded of an excellent book titled "God's Undertaker, Has Science Buried God"(published by Lion Books,UK,2009)authored by John C Lenox, Oxford University Professor in Mathematics. In this book, mention has been made of a survey done in 1916by Professor Leuba in which 1000 scientists (chosen at random from the 1910 edition of American Men of Science) were asked whether they believed both in a God who answered prayer and in personal immortality---which was more specific than believing in some kind of Divine being. The response of 70 per cent who answered was that: 41,8 per cent said yes,41,5 per cent said no, and 16.7 per cent were agnostic. The same survey was repeated in 1996 by Edward Larson and Larry Witham and was reported in Nature. In 1996, the response came from 60 per cent, of whom 39.6 said yes;45.5 percent said no and 14.9 per cent were agnostic. This survey shows that even after 80 years of enormous growth in scientific knowledge, there has been relatively little change in the proportion of believers to non believers. Non believers conversant with this fact should think twice about their campaign against religion. There are scientists like Atkins and Dawkins who strongly feel that science and religion cannot be reconciled with each other. Again, there are scientists like John Lenox and Francis Collins (author of Language of God) who feel even more strongly that Faith and Science are compatible with each other. Thus, there are Dawkins and their followers, and Collins and their followers .

In conclusion, it can be said that science and religion are both aspects of our reality. Science finds out if things are true or false; religion tells us if things are good or bad. The members of the public want things to be true and good. So, let the Followers of Dawkins and Collins not fight with each other, but live in peace and harmony, having regards for freedom of opinion and perception. Should that happen, domains of science and religion may not be separated completely.

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Publications: About 90 publications in peer-reviewed scientific journals, as well as various contributions to scientific books and book reviews. About 10 reviews of books on science-belief issues.

1. What is your definition of science and of religion?

My definition of science is brief and essentially operational: Science (by which I am referring to the natural sciences) is a rational method for obtaining causal relations among empirical facts. These facts are asserted as such in an objective manner, i.e., either by gathering given information which is readily accessible by everyone or by obtaining information through experiments which – in principle – can be performed by anyone and which yield the same results if external conditions remain unaltered. Objectivity of the method is ensured by using basic notions (such as "facts" or "causality") and applying rules of thinking (such as comparison, abstraction and logical reasoning) which can be learned and shared by different individuals. The rationality of such rules and notions is guaranteed by predictability, i.e., by finding agreement between theoretical prediction and observation. I adhere to Popper's view that scientific claims should be falsifiable. Verification of claims is possible by repeatable observation or by logical inference. Therefore, science is a specific form of interplay between observations and conclusions drawn from them, such that (ideally) an acceptable disagreement between scientific claims can only be due to imperfect knowledge of the relevant facts.

Religion is more complex than science with very different meanings in different cultural contexts. From a broad, phenomenological perspective religion may be described as an attempt to embed personal observations (be they individual or objective in the sense described above), categories of social intercourse (such as love or justice) and more general categories of experience such as meaning and purpose in a transpersonal "divine" context which is both explanatory and regulatory.

From my own Christian point of view, religion results from the encounter with God in which God opens the eyes for an evaluation of all personal life experience from God's perspective. This results in a sense of utter separation from God (called sin) because of failure to live according to God's standards, followed by grateful sense of relief through the acceptance of atonement by the death and resurrection of Jesus Christ. This restores fellowship with God. It is always God himself who steps into the life of a person. This is different from science where one can become a scientist through study and where one can teach others to become scientists. In Christianity, there is no method (mystic or otherwise) to become a Christian believer through one's own abilities or to make someone a Christian – neither by persuasion nor by bribery or coercion. God is recognized on the basis of his revelation in the bible. The spiritual experience of encounter is personal and not objectively verifiable (or falsifiable) and hence open to doubts. However, in practice, it is not more meaningful for the believer to deny the reality of God than to doubt common everyday experience shared with non-believers (such as objective observations or subjective emotions). The credibility and hence the reliability of Christian faith rest on repeated experience of the trustworthiness of the bible as well as confirmation and correction through fellowship with other believers.

2. Do you see any conflict between your definitions of these two concepts?

My definitions are rather different in nature. While both definitions heavily involve transpersonal agreement (viz. regarding what may be considered as fact or as acceptable way of developing theories), the categories involved in these two definitions differ. However, I see no conflict between these definitions since faith applies to a broader range of experience as science does. Religion deals in different ways with all kinds of experience: values, emotions, repeatable and non-repeatable empirical observations. Science is the appropriate method for treating the repeatable subset of experience.

3. Where do you think there may be a conflict between these two?

There may be conflicts at two very different levels. Firstly, since religion makes statements which belong to the category of repeatable experience (or logical conclusions drawn from repeatable experience) which is the sphere of science there is potential for a conflict in the view of the natural world. Prominent historical examples include the struggle between Galileo and the church concerning the place of the earth in the universe and the fight between creationism and Darwinism about the emergence of life. These (and other) conflicts have led to an estrangement of science and religion which has left many with the impression that science has disproved the existence of God and thus has made religion obsolete. Others, including many prominent theologians, have concluded that science and religion have non-intersecting domains of activity. Particularly widespread is the popular view that science deals with facts while religion deals with values, or more generally speaking, with the ethical and biographical interpretation of facts. This is a second area of conflict since any religion reduced to the sphere of interpretations leaves no room for a sovereign and active God. Such a view of religion ultimately implies a radical personalization of religion and hence leads to a religion without objective relevance. It is not compatible with a Christian world view.

4.What have been the grounds for the development of conflict between these two?

I am not a historian and find it difficult to answer this question on the basis of well-researched facts. However, I believe that the grounds of the conflict are mainly theological and psychological. My suspicion (restricted to the conflict in the Christian context and based on some rough knowledge of church history and the history of science and philosophy) is that the political and theological leadership of the medieval so-called Christian Western world neither had a firm biblical basis for their faith nor was biblical faith deeply rooted in the minds of a large fraction of the population. It appears to me that religion was widely seen (and still is widely seen today) as a general world view together with a set of moral rules for social behaviour. The crucial element of personal relationship with God was largely forgotten, then rediscovered in the reformation, but quickly obscured again by the instrumentalization of these religious insights for political purposes. Correspondingly, Christian ethical demands have probably appeared to many observers as hypocritical tools for asserting political power and as a loathsome burden souring everyday life. This has led to a deep distrust in the church as the representative of Christian faith and – by identifying church and faith – to ignorance of a biblical view of Christianity. (In a biblical view of Christian faith, as I see it, ethics ultimately emerge from the love of God which one experiences personally and thus enables one to love others. Such a view leaves no possibility for political abuse of Christian ethics as exhibited e.g. in the medieval crusades against Muslims, in the inquisition aimed at eliminating adherents of other religious confessions, or in the wars which occurred in the wake of the reformation in central Europe.) When in 17th century and onwards scientific evidence became available that undermined the traditional Christian world view as propagated by the church, it fell on fertile grounds by providing reasons to get rid of what seen as Christian political and moral yoke. On the church side, the conflict appears to have been sustained by varying degrees of intolerance and fear of losing control over society. It seems to me that the polarization and deep emotions involved in this conflict have contributed until today to the slow progress in its resolution.

Philosophical reasons for the conflict stem from the enormous success of extrapolation intrinsic in the scientific exploration of the world. Since scientific theories do not include any kind of divine action and since scientific theories continue to deepen our understanding of the natural world without reference to God, it appears natural to many to extrapolate the scientific world view to encompass all experience and conclude that there is no God. From a Christian point of view, there is no widely accepted philosophical concept that would incorporate scientific insights in a religious world view in a way which would avoid the conflicts outlined in the answers to the preceding question.

5. What has been the role of religion in the development of science in the West?

Again I feel not very competent to answer this question historically. It seems relevant to me that some of early developers of modern science (notably Isaac Newton) saw no conflict between science and faith. Instead they felt inspired to explore God's creation. In the development of current Western science I see no significant role of religion. Neither does religion play a large-scale role as a driving force for science, nor is religion seen as providing scientifically useful information for solving specific problems. Exceptions from this rule exist on an individual basis. E.g. Albert Einstein found it difficult to accept quantum mechanics because of his religious views. But this has not stopped the progress and success of quantum theory. Ethical discussions e.g. on the advancement of biotechnology are held entirely separately from scientific discussions of the same topic. Some individual scientists may be influenced in their choice of research area by these discussions, but modern science has no built-in ethics.

6. Can we have a religious science?

There can be no religious science in the sense that the course and method of scientific inquiry would be determined by religious thoughts. However, there can be a religious science in which religion provides a framework for embedding scientific insights in a broader world view. Concerning pure knowledge, such a science would discover how God has made the world. On the other hand, as it seems difficult in practice to disentangle the notions of purpose and value from "pure" science, religious science might suggest what directions of research are desirable.

Since religion represents a personal conviction, such religiously motivated concepts of science cannot be enforced by any authority onto individual researchers. An attitude other than tolerance towards different views of religious science is bound to lead to disaster. This does not imply that religious science should be a purely private matter. The public dialogue about a science embedded in religion is meaningful as it may help broadening the narrow world view of a science which considers as real only what belongs to its realm of inquiry.

7. Can science dispense with religion?

If science is only seen as a method for gaining knowledge about certain aspects of the world, it can surely dispense with religion. However, science plays a central role in understanding not only the events occurring regularly in the natural world but human life in general. Hence, science should not dispense with religion. A view of human life with reference to religion only as a sociological or psychological fact involves a methodical asceticism which accepts as factual evidence only that which is (essentially) undeniably true. Instead I believe that a balanced view of reality is gained by an inverse methodical asceticism which ignores as factual evidence every claim that is (essentially) undeniably wrong. In such an intellectual framework science still plays a central role, but is only one of several complementary approaches to understand the world. In particular, such an approach to reality leaves room for different interpretations of the world and thus gets rid of the absolute and intolerant reign of a rationalistic materialism.

8. Can one separate the domains of activity of science and religion completely?

This is partially answered in the reply to the previous two questions. A complete separation has to be criticized since in the scientific approach *a priori* only such evidence is regarded as potential fact which falls into the class of scientifically tractable problems. Hence, evidence which can be only interpreted as resulting from divine action is methodically excluded from a purely scientific world view.

In a separated framework, religion can play a role only by providing purpose and value and by giving a metaphysical foundation to science. However, Christian faith views God as creator and sustainer of the natural world and as redeemer from the loss of fellowship with him who will eventually create a new universe. Hence, his activity falls into the domain of science. This lends an "objectivity" to the existence of God which is crucial and prevents religious convictions from being man-made and therefore from being essentially arbitrary and purely subjective.

Of course, the truth of this claim is not scientifically verifiable. Hence, a meaningful religious debate can take only the form of giving personal testimony about religious experience and convictions. Nevertheless, the religious claims which are made on the basis of subjective experience and insight are believed and communicated as being of objective relevance. On this basis conflicting views about "objective" reality can coexist and be treated humbly and respectfully.

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1. What is your definition of science and religion?

'Science', as a process, is any organized and systematic study of, and research into, the natural and cultural world. Such a process results in an organized, systematized body of recorded knowledge, which we also call science. So, science refers both to this process of systematic research and study, as well as the body of knowledge resulting therefrom.

Such a holistic definition is more faithful to the original sense of the term, and thus, it does away with the relatively late, largely contrived bifurcation between what is called 'natural science' and what is called 'human science', or 'social science' for that matter, and the dogmatic prioritization of the former over the latter.[1] Moreover, this holistic meaning of science is much more in accord with the classification of the sciences in, say, Islamic intellectual history.[2]

Since it is only thinking, articulate human beings who do science, not animals, plants, minerals or nature itself, then all sciences, including the natural, exact or hard sciences, even mathematics, are, in this sense, social or human sciences; that is, they are, without exception, products of conscious, self-conscious and reflexive human minds. It follows then that *all* sciences are human sciences, and these are now largely differentiated into two main categories: (i) the category that attends to the world of nature, hence natural science, and (ii) the category that attends to the world of culture, hence social or human science proper.[3]

The natural sciences study and research into the world of nature insofar as it is not modified by human interactions with it, notwithstanding the fact that this very study of nature may in certain cases entails its unavoidable modification by the scientist doing the study.[4] In contrast, the social sciences study and research into the world of culture or human activities in the manner these relate to human interactions among themselves and with their natural environment. For instance, the field of social ecology (or human ecology[1]) researches into the complex interrelations between human settlements and their diverse cultural and natural environments.

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[1] A good discussion is Rögnvaldur D. Ingthorsson, "The Natural versus the Human Sciences: Myth, Methodology and Ontology," in *Discusiones Filosóficas*, 14:22 (2013), 25 – 41.

[2] Osman Bakar, *Classification of Knowledge in Islam: A Study in Islamic Philosophies of Science* (Cambridge: Islamic Texts Society, 1998). A recent discussion is Rick Szostak, *Classifying the Sciences: Phenomena, Data, Theory, Method, Practice* (Dordrecht: Springer, 2004).

[3] One may arguably add a third category, namely, (iii) those sciences that attend to both the natural world and the human world, such as medicine, linguistics, agriculture and human ecology; or even a fourth category, namely, (iv) those sciences that attend to what transcends the natural or cultural worlds, i.e., the philosophical sciences of logic, metaphysics, ontology and the like.

[4] This is the so-called "observer effect," in reference to the fact that the very act of observing

Now, the fact that all sciences, natural or social, are human sciences produced by human beings, and human beings have belief and value systems, or what I call *belief-value* systems, then all sciences, mathematics included,[2] are belief- and value-laden in one way or another; and these values are both cognitive and moral, or epistemic and ethical, and, moreover, the epistemic is inextricably intertwined with the ethical, for even an amoral scientific enterprise, if indeed there is such a thing, cannot help but be ethical if it is to be an *enterprise*.[3] Such value-ladenness may not be apparent to most people in the case of the so-called hard or exact (quantitative) sciences like physics or mathematics, but it is inherent in them nonetheless.[4] It is through to this inevitable value-ladenness of science that religion, specifically, its metaphysics and theology, enters into the very conception of science itself, framing and impacting on its scope, classification, direction and even content. But what is 'religion'?

Religion, for our immediate purpose here, can be defined, in the most generic sense, as a deep personal commitment to a set of more or less systematic beliefs about what is ultimately real and true, and to what that ultimate reality entails for human conduct in life. Religion is thus a personal commitment to an ontology and to an axiology derived from it, and as such, even the non-religious or the atheist cannot but professes some form of religion or *belief-value* system, even if they would not wish to call it religion,

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impacts on the phenomenon being observed: K. Baclawski, "The Observer Effect," in→ *2018 IEEE Conference on Cognitive and Computational Aspects of Situation Management (CogSIMA)* (Boston, MA: IEEE, 2018), 83-89.

[1] R. Dyball and B. Newell, *Understanding Human Ecology: A Systems Approach to Sustainability* (London: Routledge, 2015).

[2] Paul Ernest, "Mathematics and Values," in Brendan Larvor, ed., *Mathematical Cultures* (New York: Springer, 2014), 189-214; cf. D. Lachterman, *The Ethics of Geometry* (London: Routledge, 1989).

[3] Agnieszka Lekka-Kowalik "Why Science Cannot be Value Free," in *Science and Engineering Ethics*, 16 (2010), 33-41.

[4] Harold Kincaid, et alii, eds, *Value-Free Science: Ideals and Illusions* (Oxford: Oxford University Press, 2007).

but rather, worldview, ideology, a set of basic assumptions or even the "hard core" of a scientific research program.[1]

In the case of Islam, the term 'religion' has its correspondence in the term '*dīn*', which basically refers to man's sense of indebtedness to God for His most gracious gift of existence to him and all the bounties arising from it to which his proper response is that of gratitude (*shukr*), expressed in objective terms as his total comprehensive submission (*Islām*), in body, mind and spirit, to the Revealed Law (*Sharī'ah*). Thus, in Islam, religion is both (1) a revealed belief or creedal system (*'aqīdah*) about Ultimate Reality (*al-Ḥaqq*) and its relation to Creation (*al-Khalq*), and (2) a revealed ethico-moral system guiding man's proper response or responsibility (*amānah*) to that Reality, and by extension, to Creation as manifestations (*tajalliyyāt*) of that Reality that are brought "near" (*al-dunyā*) to human experience. The first pertains to the cognitive content of religion (*'ilm*) as it relates to what is true and real (*ḥaqq*, *ḥaqīqah*); the second to its ethico-moral content (*ādāb*, *akhlāq*) as it relates to what is right and proper comportment (*'amal*) towards what is true and real. Hence, *iqtiḍā'u al-'ilmi al-'amala*, or true knowledge demands right comportment (*ādāb*) in accord with it.[2]

From the foregoing working definitions of science and religion, we can see that the very act of thinking, and thus knowing, has an ethico-moral and thus "religious" dimension to it, including the thinking and knowing we do in science as scientists engaging in the systemic study and hence observation of, and interaction with, the natural and cultural world. Even if we concede, for the sake of argument, to the conventional notion of science as referring to the "value-free" systematic study of nature, still, it is in the interest of science and thus scientists to ensure the conservation of nature and thus of the continuation of science as a viable enterprise. In short, the very study of nature, seen as having cognitive and pragmatic value, entails a sense of moral responsibility on the part of scientists for the preservation of nature.[3]

Furthermore, since science or scientific research requires inter-subjective collaboration among scientists, then it is not merely enough to observe accurately, which relates to accuracy as an "intrinsic" cognitive value, but also to report honestly, which refers to honesty as an "extrinsic" moral value. Hence science is not only a cognitive project but also a very moral one, and thus, it is, in that sense, also religious and demands personal commitment. In other words, science is both personal and impersonal knowledge, imbued through and through with both facts and values such that the two, though arguably distinctive, are inseparable; indeed, *facts presuppose values and are thoroughly imbued with them.*[1] Like religion, science is both directed by reason and motivated by passion towards "increasing contact with Reality."[2]

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[1] Imre Lakatos, *The Methodology of Scientific Research Programmes* (Cambridge: Cambridge University Press, 1978).

[2] Syed Muhammad Naquib al-Attas, *Prolegomena to the Metaphysics of Islam: An Exposition of the Fundamental Elements of the Worldview of Islam* (Kuala Lumpur: ISTAC, 2001), 41-90.

[3] John A. Vucetich and Michael P. Nelson "The Moral Obligations of Scientists," in *Minding Nature*, 3:2 (Summer, 2010), 48-49.

2. Do you see any conflict between your definitions of these two concepts?

Given the foregoing working definitions of religion and science, instead of conflict between the two, what we can see here is the fact of science as being *subsumable* under, and directed by, religion *qua* belief-value system, even if this system is called by other names, such as worldview, ideology or "hard-core" assumptions.[3] In other words, there are always some foundational metaphysical presuppositions and ethico-moral evaluations underpinning the apparent physical data, facts and theories, hence the untenable project of the logical positivists in their vain quest for a metaphysics-free theory of what counts as objective, verifiable science of universal validity.[4] Instead of conflict, the fact of the matter is that religion, whether conventionally understood as such, or as some set of foundational metaphysical assumptions about Reality, lies at the core or hardcore of science. The perceived conflict is merely a function of the largely contrived dichotomy between the two.

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[1] Hilary Putnam, *The Collapse of the Fact/Value Dichotomy and Other Essays, Including the Rosenthal Lectures* (Harvard: Harvard University Press, 2002); Robert A. Harris, "A Summary Critique of The Fact/Value Dichotomy," in https://www.virtualsalt.com/int/factvalue.pdf (accessed November 04, 2020).

[2] Michael Polanyi, *Personal Knowledge: Towards a Post-Critical Philosophy* (Chicago: University of Chicago Press, 1974).

[3] Louis Katsoff, "Presuppositions of Science," in Louis Katsoff, *Physical Science and Physical Reality* (Dordrecht: Springer, 1957).

[4] Asad Zaman, "The Rise and Fall of Logical Positivism," in *Express Tribune*, October 04 (2015).

Moreover, science and religion subscribe to two distinct teloi or goals. One is concerned about discovering what is provisionally true about the structures and functions of culture and nature, and the pragmatic applications of this provisional truth to realize some notion of human progress or welfare in the forms of useful services, products and technologies. Religion, while also to some extent driven by concern for temporal human well-being on earth, is much more concerned about ascertaining what is ultimately Real and True as the basis for eternal salvation in the Afterlife. Even then, science is not free from some form of eschatological teleology, though it may be a secular one expressed in the historicist-progressivist terms of a utopian futurology of trans-human perfection.[1]

To the extent science goes into questions of ultimate reality or ultimate truth, attempting to answer them in some categorical manner through its largely abdutive-deductive-inductive method, then, to that extent it goes beyond its epistemic remit, so to speak, and risks coming into conflict with the religious, mystical, theological, and philosophical perspectives on reality. This problem is compounded by the fact that most scientists are poorly trained, if at all, in conceptual, philosophical and theological analysis and reasoning, and they tend to be rather cavalier in addressing problems that are, at bottom, metaphysical rather than empirical or mathematical in nature. It is when science chews off from reality much more than it can bite and digest that it tends to rush into largely unnecessary conflict with religion, metaphysics, theology or even basic common sense. Hence, all good, critical and reflective scientists should make it part of their vocation to acquire a sufficient degree of familiarity with the history and philosophy of science.[2]

3. Where do you think that there may have been a conflict between the two?

The locus of conflict is mostly at the level of incommensurable hard-core assumptions, which have more to do with ontology and cosmology (aka, the nature of nature and culture), that is, more about the interpretation of the given empirical data or facts to arrive at some more or less accurate and reliable big picture of Reality, but not so much at the level of epistemology and methodology, because the very fact that we are having this dialogue between what is called science and what is called religion indicates some degree of *methodological equivalence* or methodological common ground between science and religion rendering such a dialogue even possible and thus to some degree meaningful and, hopefully, mutually beneficial. This methodological equivalence between the two consists in their common commitment to *methodological naturalism*, which is to articulate explanations for natural phenomena in terms of "internal" natural causes and effects or phenomenal regularities generalizable as "laws of nature" while keeping in abeyance the question of the ontology of these causes, effects or regularities.[1]

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[1] J. Benjamin Hurlbut, Hava Tirosh-Samuelson, eds., *Perfecting Human Futures: Transhuman Visions and Technological Imaginations* (Wiesbaden: Springer, 2016).

[2] Till Grüne-Yanoff, "Teaching Philosophy of Science to Scientists: Why, What and How," in *European Journal for Philosophy of Science*, 4 (January, 2014), 114-134.

The *underdetermination*[2] of conceptual hypotheses or theories by empirical data, facts or evidence shows that scientists need to be a bit more humble about their truth-claims and thus more open to serious considerations of what they deem to be "unscientific" religious truth-claims. Given some degree of methodological equivalence between science and religion, then it is quite possible, and even desirable, to subject both scientific truth-claims and religious truth-claims regarding some problematic aspects of nature or culture to systematic investigation based on well-defined, objective, and hence, shared meta-theoretical and meta-methodological criteria.

For example, in the case of the evolution-creation controversy and debate, scientists, whether religious or non-religious, can work together towards reformulating the metaphysical religious concept of 'creation' in terms rendering it amenable to systematic rational and empirical inquiry. Thus reformulated, the originally religious problem of creation can be rendered as a scientific problem by posing the following basic, falsifiable empirical question regarding it: *If nature has arisen through creation rather than evolution, then what are the observable features, if any, of the natural world that would, on balance, indicate it as having come into being through purposive design rather than through chance or seemingly stochastic processes?*

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[1] Stephen C. Meyer, "Methodological Equivalence of Design and Descent," in the *Creation Hypothesis*, ed., J. P. Moreland (Downers Grove, IL: InterVarsity Press, 1994).

[2] In philosophy of science, 'underdetermination' refers to the fact that a scientific theory can never find evidence sufficient enough to fully determine or prove it to the exclusion of all other theories or possible explanations.

4. What have been the grounds for the development of conflict between these two?

Conflict may occur when science and religion are seen as parallel approaches to the ascertainment of what is true and real that not only do not meet, for the most part, in the cognitive sense, but also that may occasionally vie with one another for social and/or political hegemony in the world over the allegiance and minds of men, or when one aims to displace the other as the paradigm for the understanding of nature and culture, leading to counter-responses from the other party.

Obvious cases in point in this respect is the creation-evolution, mind-body and body-soul debates,[1] when one side posits a set of truth-claims about some aspects of the natural and cultural worlds that actively contradicts or questions the corresponding set of truth-claims posited by the other side. This conflict cannot be resolved if the two opposing truth-claims, based as they were on opposing sets of largely unfalsifiable hard-core assumptions, cannot be logically reconciled. However, insofar as the two opposing camps seek to talk to, or even argue with, one another, then, they would need to agree on some degree of methodological equivalence or epistemic common-ground rendering such an exchange feasible.

Hence, what we see is, in reality, or from a deeper level of analysis, not some conflict between religion and science as such, but between one belief-value system and another belief-value system seen to be a threat to it, or even displacing it altogether. Nevertheless, we dare say that there is a deep epistemic concord between religion and science, and that the real conflict begins when empirical science is conflated with *philosophical naturalism*[2] and, thus, over-extends its rather limited epistemic remit to make bold claims against religious or any other forms of metaphysical belief-value systems.[3]

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[1] J. P. Moreland, ed., *The Creation Hypotheses: Scientific Evidence for an Intelligent Designer* (Downers Grove, IL: InterVarsity Press, 1994); Karl Popper and John Eccles, *The Self and Its Brain: An Argument for Interactionism* (London: Routledge, 1984); Mario Beauregard, *The Spiritual Brain: A Neuroscientists's Case for the Existence of the Soul* (New York: HarperCollins, 2007).

[2] Philosophical naturalism is a metaphysical, unfalsifiable belief-value system that nature and natural entities, processes and structures constitute or encompass the whole of what is Real, excluding all supernatural entities.

[3] Alvin Platinga, *Where the Conflict Really Lies: Science, Religion, and Naturalism* (Oxford: Oxford University Press, 2011).

5. What has been the role of religion in the development of science in the West?

Religion, both as personally held belief-value systems and as public institutions like the Church, has undeniably been a central factor in the development of science in the West. Religious scientists see nature as the handiwork of the Creator, and natural laws or phenomenal regularities perceived therein as expressions of the Divine Will and Wisdom (or Divine Habit, *sunnat Allah*) made manifest to their senses and intelligible to their minds, hence the scientific study of nature for them is but an extension of the ritual prayer or worship, and just as devotional. Despite all the denials and obscurantisms of the purported devotion of the Enlightenment to Absolute Reason, the fact remains that religion has always been the fertile soil of scientific inspirations, developments and discoveries in the West, nurturing them well into the modern era.[1]

The long running debate in neighboring Islamic lands between the *falāsifah* (philosophers) and the *mutakallimūn* (analytico-dialectical theologians) over problems of metaphysics and physics was followed with deep consuming interest by the Latin scholastics of Western Europe. This important intellectual development led them to a critical rethinking of Aristotelian metaphysics and physics, and Aristotelian science in general, and serious consideration of various forms of atomism and occasionalism as replacement for the standard hylomorphic cosmology. This critical appropriation of *kalām* atomism and occasionalism in the West through scholastic philosophical and theological debates was a significant factor in the rise of early modern science, which is characterized by, *inter alia*, its systemic reconsideration and even outright rejection of the age-old Aristotelian metaphysics of matter and form.[2]

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[1] Stanley L. Jaki, *The Road of Science and the Ways to God* (Chicago: University of Chicago Press, 1978).

[2] George Saliba, *Islamic Science and the Making of European Renaissance* (London, MIT Press, 2007); Charles Burnett, "Arabic into Latin: the Reception of Arabic Philosophy into Western Europe" in Peter Adamson and Richard C. Taylor, eds., *The Cambridge Companion to Arabic Philosophy* (Cambridge: Cambridge University Press, 2006), p. 370ff; and Richard Arthur, "Time Atomism and Ash'arite Origins for Cartesian Occasionalism Revisited," in Arun Bala, ed., *Asia, Europe and the Emergence of Modern Science: Knowledge Crossing Boundaries* (New York: Palgrave, 2012), 73-92.

Another factor to take note of is that throughout the Enlightenment period up to say the early 20th century, most scientists in the West were religious, and many saw their scientific vocation as simply a natural extension of, or subsumable under, their religious devotion. As in its scientific thought, Enlightenment ethical thought, despite its disavowal of Revelation and Tradition, and wholehearted embrace of supreme Reason as the arbiter of truth and falsehood, and good and evil,[1] could not help but build up its grand secular humanistic Utilitarian ethical system against a rich backdrop of philosophico-religious, virtue ethical conceptions, including the conception of the common good, though now shorn perhaps of much of their original devotional content and context.[2]

6. Can we have a religious science?

If science is something done by scientists, and if scientists are thinking, reflexive human beings rather than automatons, more or less committed to some belief-value system, or worldview, then all sciences are, in some manner, subsumable under the term "religious science," even if they are not conventionally described as such.

Moreover, science can benefit a lot from metaphysical insights from religion and theology. For example, the *kalam* metaphysics of atoms and accidents brought about a rigorous, systematic reconceptualization of physics away from its previous, largely dogmatic adherence to Aristotelian form and matter, leading to the formulation of new, productive empirical research programs in astronomy, mathematics and physics. So long as the relevant metaphysical insights from religious belief-value system are rendered amenable to rigorous, systematic rearticulation in objective terms open to rational and empirical investigations into their truth-claims, that is, *open to methodological naturalism*, then secular science can and should partner with religious science towards the common goal of furthering man's appreciation for, and understanding of, the workings of nature and culture.[3]

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[1] At least, that is the general, popular impression of the Enlightenment as the age of the triumph of Reason over Revelation and Tradition, but the actual historical record paints a much more nuanced picture.

[2] Alasdair MacIntyre, *After Virtue: A Study in Moral Theory*, 3rd ed. (Notre Dame, Indiana: University of Notre Dame Press, 2007). S. J. Barnett, *The Enlightenment and Religion: The Myth of Modernity* (Manchester: Manchester University Press, 2003); Simon Grote, "Religion and Enlightenment," in *Journal of the History of Ideas*, 75:1 (2014), 137-160.

[3] Adi Setia, "*Taskhir*, Fine-Tuning, Intelligent Design & the Scientific Appreciation of

7. Can science dispense with religion?

From the foregoing, it seems clear to me that science cannot dispense with religion in the same manner that it cannot dispense with some set of metaphysical presuppositions about the nature of nature or of culture, even if such presuppositions are not conventionally deemed as religious or as constituting religion. Moreover, there is simply no real reason why science should dispense with religion, or, for that matter, with any other non-scientific sources for insights, inspirations, intuitions and ideas. The *de facto* context of discovery[1] should be allowed to be as diverse and open ended as possible, so long as the post-discovery, *de jure* context of justification is rigorously and systematically defined in the shared epistemic terms of methodological equivalence—specifically *methodological*, as opposed to philosophical, naturalism—between science and religion.

As a matter of fact, it is not only that science cannot do without religion, but that it might not even survive without it. Indeed, "scientists are beginning to learn that without theology science can remain dangerously incomplete and exposed."[2] The study of the history of ideas, and, especially, of the interplay between religious and scientific ideas, have shown that intellectual symbioses between theological insights and empirical inquiries have been the norm rather than the exception. So long as science and religion agree to work together on this shared epistemic common ground of methodological naturalism, there is simply no compelling reason why either would want to dispense with the other.

8. Can one separate the domains of activity of science and religion completely?

Such a separation is not possible in principle given the inextricable overlap between science and religion, or, if we prefer, between science *qua* empirical study of nature and science *qua* the metaphysical commitments underpinning it, which overlap renders such a study even possible in the first place, as well

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Nature," in *Islam & Science* (Summer, 2004).

[1] Paul Hoyningen-Huene, "Context of discovery and context of justification," in *Studies in History and Philosophy of Science*, 18:4 (December 1987), 501-515.

[2] John Habgood, "Can Science Do Without Religion?," in *RSA Journal*, 139:5416 (March, 1991), 242-250.

as given the ethico-moral commitments required to create the scientific community needed to objectively or inter-subjectively authenticate the results of such a study. Since such a separation is not possible in principle, it is *a fortiori* not possible in practice, for this would require, among others, that scientists draw a sharp demarcation between their personal belief-value systems, religious or secular, and their actual empirical scientific work.

Such a separation, if carried out in earnest, would pretty much amount to an intolerable intellectual inquisition, and could find us ending up with a world without scientists at all! Another impracticality is that of the fact that many scientists in the West and the East are explicitly and formally religious, in that they openly profess adherence to one or the other of the major religions of the world.[1] So, if this separation results in only secular or atheistic scientists being allowed to do science, then many scientific research institutions and university science departments in the world will have to close shop or have much of their work disrupted.

Moreover, such a separation is totally unnecessary for the progress of science *qua* systematic study of, and research into, the natural and cultural worlds. Scientists, religious or otherwise, can bring whatever religious or non-religious metaphysical commitments to the empirical scientific research table, so long as they are willing and able to rearticulate the possible scientific implications of these commitments in terms of hypotheses and theories open to rigorous, systematic investigation according to the principles and practices of methodological naturalism.

To conclude, we say there is no real need for science and religion to have to agree on everything or even on anything in particular, or to disagree, for that matter. They only need to find concord on mutually acceptable forms of methodological naturalism to resolve any conflicts, trivial or substantial, that may arise between them from time to time regarding the entities, processes and structures of the natural and cultural worlds. As decent, reasonable human beings committed or resigned to living, even thriving, in peace and prosperity with one another, all of us, religious or otherwise, have much more better things to do for ourselves and our children on this long suffering Earth than dissipating our precious time, resources and energy into making so much ado about basically nothing.

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[1] Elaine Howard Ecklund, et alii, "Religion among Scientists in International Context: A New Study of Scientists in Eight Regions," in *Socius*, 2 (2016), 1-9.

Prof. Giuseppe Sermonti

Date of Birth: 1925 (Rome, Italy)

Post-Doctoral Professional Experience: Professor of Genetics at the Universities of Palermo and Perugia; Elected Vice-president of the XIV International Congress of Genetics in Moscow (1978); Co-founder of the Osaka Group for the study of Dynamic Structures; Editor in Chief of *Rivista di Biologia / Biology Forum* (since 1979). Author of Books on Evolution and on exegesis of Fairy Tales, published recently as: *L'Anima Scientifica* (*The Scientific Soul*).

1. What is your definition of science and of religion?

Science may be defined as an approach to the knowledge through reasoning and experience. Religion is such an approach through revelation or tradition. Science puts emphasis on Utility (although not immediate) and Religion on Significance. While Science is man-made, Religion makes man.

2. Do you see any conflict between your definitions of these two concepts?

There is not *a priori* conflict between Science and Religion as defined above. They could complement or confront each other. There is however a historical diffuse intention in science to abolish significances and to replace the natural and supernatural scenery provided by Religion with a purely mechanical representation of the world. A conflict between Science and Religion rises whenever Science assumes to cover the whole reality ("scientism") or when Religion pretends to dictate to Science the limits of the assertable or the facts of the latter's investigations.

3. Where do you think there may be a conflict between these two?

The crucial conflict between Science and Religion is anyway on the ethical ground. Science tends to discount any human achievement which is not rational or experimental (faith is considered as naïve prejudice and a sin against Reason). On the other side, Religion has often perceived a scent of heresy and diabolic in the wild nature as well as in the man's (and woman's) instincts. To some extent, there has been a convergence of Science and Religion against the fantastic and the prodigious, i.e. against the sorcerers and the witches.

4. What have been the grounds for the development of conflict between these two?

The historical conflict between Science and Religion (during the Renaissance) rose from the pretence of Science to make statements with religious implications ("The sun is the center of the Universe"). Thus the two forms of knowledge entered into conflict as two contrasting religions. Later, the religious pretences of Science faded (Science accepted the conventionality of its truths, as Bellarmino pretended) and Science and

Religion found a kind of agreement about their own jurisdiction. As Robert Musil paradoxically remarked, Science was expected to deal with real but trivial things and Religion with unreal but supreme things.

5. What has been the role of religion in the development of science in the West?

Science does not mind values (see Jacques Monod 1970). It is founded on current values preceding the origin of Science. Such values are the search for truth, the appreciation of order, the belief in the existence of stable laws, the honesty, the sacrifice, the humanitarianism, as well as the above mentioned distrust on the marvellous. All these values of Science derived from Religion and Tradition.

6. Can we have a religious science?

Ancient Sciences, as Alchemy, Astrology, Mantic Art, Hermeneutics, Eschatology, were indeed "religious sciences". They were gradually replaced by Chemistry, Astrophysics, Forecasting, etc. Their conversion took place through a dismissal of the spiritual commitment on the side of the operator. An alchemist participated to the purification of the matter by his own purification, a chemist may be a merchant or a delinquent, with no assumed relevance for his work.

A religious Science can still be figured also in the present. It should avoid the ethical (or political) issues and view Science as representation of Universe and Nature. The sceneries may turn out not be equivalent. Adam and the Ape are surely not coincident, but they are conflicting just because the Ape was not an unbiased result of a scientific investigation, rather a symbolic being put there to replace and to sneer at Adam and his divine origin. Addressed to the majesty, the grace and the mystery of being, the Religious and the Scientific knowledge may merge and enter into an alliance, as an ancient Wisdom, involved in the exegesis of sacred texts and icons or in the contemplation of the precious fresco of nature.

7. Can science dispense with religion?

At its origin, Science could not dispense with Religion; it was a branch of Theology. Presently, it requires a religious inspiration, not to become involved in practical and political issues and in order to avoid subtle virtuosities about nothing.

8. Can one separate the domains of activity of science and religion completely?

Separating Religion from Science would be so absurd as separating Mathematics from Physics. A religious man may be a theologian, a mystic, an eschatologist, a theodicean or a scientist. They may adopt different Liturgies, but all deal with the indivisible Being, and its mysterious order and unpredictability.

In the common opinion, science deals with this world and religion with "the other" world. This world, however, is not understandable by itself, without recourse to external laws. The world around us is where the laws become manifest, but they cannot be understood without a constant inspiration coming to our mind from Outside.

Prof. Misbah-Ud-Din Shami

Date of Birth: October 1, 1930 (Jullundur City, India)

Education: B.Sc. (1950) and M.Sc. Tech (1952), Punjab University; Ph.D. in Chemistry, Washington State University (1964).

Post-Doctoral Professional Experience: A member of staff at the University of Punjab for more than 25 years, he became a Professor in 1970; Dean of the Faculty of Natural Sciences, Engineering and Pharmacy in 1973 and Pro-Vice-Chancellor of the Punjab University, Lahore (1974-1976); Chairman, Pakistan Science Foundation (1980-1990); retired in 1990; Fellow of the Pakistan Academy of Sciences; Fellow and Past-President of the Pakistan Institute of Chemical Engineers; Member and Past-President of the Pakistan Association for the Advancement of Science; Member and Past-President of the Pakistan Association of Scientists and Scientific Professions; Past-President of the Scientific Society of Pakistan; a Founding Fellow of the Islamic Academy of Sciences (1986) and Council Member (1994-1999); Various designations at the Pakistan Academy of Sciences including President, Secretary General and Editor; Vice-President, Islamic Academy of Sciences, Amman, Jordan.

Awards: The International UNESCO Kalinga Prize (1990); Niels Bohr Medal for Popularization of Science; The Sitara-Imtiaz (1990); The National Talent Award (1987); The Iqbal Centenary Commemorative Medal by the President of Pakistan (1974).

Publications: He has co-authored two textbooks in Chemistry, prepared Medium-Term Plan of ISESCO (2001-2009), and has published several papers in Pure and Applied Sciences.

1. What is your definition of science and of religion?

Religion generally means to believe in something supernatural or unseen. It may be based on rules and regulations set by a divine power or those governed by earthly philosophies. The major issue tackled is an individual's relationship with the Creator and His creations. Science has rather to do with observation of physical world and to draw conclusions about its existence. It mostly talks about things which can be observed, and their behaviour proven through experimentation. Its study is necessary to determine the laws of nature and get benefits to make our life more comfortable and gainful.

2. Do you see any conflict between your definitions of these two concepts?

Apparently both science and religion have a common objective, i.e., to enable mankind to live comfortably in peace and harmony with others. If a religion is flexible and science is practiced within the scope defined by religion, then I do not see any conflict between the two. This suppleness is evident in the revealed religions.

3. Where do you think there may be a conflict between these two?

The laws of science, being based on study of the physical world, can be described on the basis of logic. On the contrary, certain beliefs in a religion may not be justifiable through reasoning. Also, if the rationalization offered by religion is beyond comprehension, it could lead to the conclusion that a phenomenon is not as described by science. In the same fashion, it could happen that a clarification offered by a religion is beyond comprehension, in light of scientific theories presented till that time. Nevertheless, the advancement of science has frequently brought a deeper understanding of many Qur'anic *āyāt*.

4. What have been the grounds for the development of conflict between these two?

Religions define boundaries whereas science is in constant pursuit of extending the old ones. Before further discussion, let us see what a conflict is. According to one definition, a conflict is a perceived incompatible difference resulting in some form of interference or opposition. There could be two apparent reasons for such interference between science and religion.

(a) The first type of conflict could arise whenever there is an overlap in the boundaries of two concepts and the explanation given by one differs from that offered by the other. This does not necessarily mean that any of the two is absolutely wrong. At times, especially in the case of revealed religions, it is noticeable that science is not able to justify certain religious perceptions at the outset, but ongoing research later endorses the concepts presented by a religion.

(b) The second type of conflict may crop up if science tries to tackle an issue outside the boundaries admitted by a religion. Some of the most sensitive concerns could be abortion, human cloning, or test tube babies. Let us take the example of test-tube babies. A simple account of the development cycle of a human foetus is given in Holy Qur'an, which is also supported by science. I believe test-tube babies also follow the same growth pattern.

5. What has been the role of religion in the development of science in the West?

It is said and believed that the West developed scientifically after putting religion aside. This is so in case of the role played by Christianity, which at that time contained a blend of customs and rituals and tried to suppress the new scientific ideas, considering them to be a threat to religious supremacy. Science was giving people a new way to think and argue. Christianity, on the other hand, was adamant to make people believe what the church wanted to. This first lead to side lining and later total rejection of the religious beliefs, considering them to be a hindrance in the development process. Science had blossomed in the same West when Muslims were ruling Spain; these Muslim scientists not only gave new theories but always respected the domains of the religion. Islam rarely restricted their thinking process. This demonstrates the flexibility of Islam and its parallelism with the way of thinking offered by science.

6. Can we have a religious science?

Religion gives a code of conduct for inter-human relationship and the association with the Almighty Allah. Although the latter is one's personal affair, the former has a deep impact on our daily lives. Similar effects can be witnessed with the advent of science. The main idea, of course, is to align our actions for the benefit and welfare of living beings, in general, and of mankind in particular. If the scientific studies are pursued such that they seek the long-term well-being and happiness of mankind, I consider them to be a form of religious science.

7. Can science dispense with religion?

It is definitely advantageous to define objectives in life. These objectives define the scope and restrict us within certain boundaries. In my opinion, religion does set boundaries for conducting some types of scientific research. Rather than seeing them as rivals, both science and religion must supplement each other, for the good of humanity.

8. Can one separate the domains of activity of science and religion completely?

As a Muslim, one cannot separate the two domains. In my humble opinion, Islam must take the lead and science should follow. The Qur'an does offer such guidance at various places, where Allah the Almighty directs the readers to instigate their thinking process by giving them a clue regarding a physical event. Islam provides incentives for scientific studies by asking its followers to think seriously about the creations of Allah (SWT).

Prof. Huston Smith

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Education: A.B. (1940), Central Methodist University, Fayette, MO; Ph.D. in Philosophy of Religion (1945), University of Chicago.

Post-Doctoral Professional Experience: Assistant through Associate Professor of Philosophy (1947-58), Washington University; Professor of Philosophy (1958-73); Massachusetts Institute of Technology; Thomas J. Watson Professor of Religion and Distinguished Adjunct Professor of Philosophy (1973-83), Syracuse University.

Publications: Over 70 articles and 10 books, including: *Forgotten Truth* (Harper San Francisco, 1993); *Beyond the Post-Modern Mind* (Updtd & Revd editions, 1989 and 2002); *One Nation under God: The Triumph of the Native American Church*, ed. (Clear Light Pub., 1998); *Why Religion Matters: The Fate of the Human Spirit in an Age of Disbelief* (Harper San Francisco, 2000);*The Way Things Are* (University of California, 2003).

1. What is your definition of science and of religion?

Science studies the empirical world. Religion seeks to understand and bind us to the entire scheme of things in which God is preeminent.

2. Do you see any conflict between your definitions of these two concepts?

Not if, and when, each sticks to its proper task.

3. Where do you think there may be a conflict between these two?

When either oversteps its proper limits. Religion does this if/when it interferes with science's attempts to understand the empirical world, the physical world of nature. Science oversteps its limits if/when it claims to be able to access, and give definitive answers (without the help of religion) to ultimate questions, such as who are we, how did we get here, what is the meaning of life, and is there life after death?

4. What have been the grounds for the development of conflict between these two?

Historically, both have overstepped their proper bounds. In the West, theologians were guilty of this when (in the 16-17th centuries) they interfered with scientific pursuits. Now the shoe is on the other foot. Today, most of the transgressions come from science's side.

5. What has been the role of religion in the development of science in the West?

This is a complex subject that does not admit of a short answer.

6. Can we have a religious science?

No. But we can have a science that is completely compatible with religion.

7. Can science dispense with religion?

Yes. But human beings cannot.

8. Can one separate the domains of activity of science and religion completely?

Their rightful provinces can be distinguished. But they should complement each other – fit together like the pieces of a jigsaw puzzle – in providing us with a comprehensive view of whole of reality insofar as such a view is humanly attainable.

Prof. Wolfgang Smith

Date of Birth: 1930 (Vienna, Austria)

Education: B.S. in Physics, Mathematics and Philosophy from Cornell University (1948); M.S. in Physics from Purdue University; Ph.D. in Mathematics from Columbia University.

Post-Doctoral Professional Experience: Held faculty positions at M.I.T. and U.C.L.A. and Oregon State University; Professor of Mathematics at Oregon State University from 1968 till his retirement in 1992.

Books: *Cosmos and Transcendence*, (Sherwood Sugden & Co, 1996); *Teilhardism and the New Religion*, (Tan Books & Publishers, Inc., 1985); *The Quantum Enigma*, (Sherwood Sugden & Co, 1996).

1. What is your definition of science and of religion?

We may take it that the object of natural science is to understand the operations of Nature through the discovery of natural laws. Each particular science, however, is defined by its own methodology, and is therefore concerned, not simply with Nature or Reality as such, but with a particular stratum or level of reality, determined by what might broadly be termed its means of observation.

Religion, on the other hand, has to do with the ultimate good of man, and is consequently concerned, first and foremost, with the relation between man and God. Religion is not, moreover, a man-made thing, an institution that has somehow "evolved" as one is nowadays prone to imagine, but is based upon a divine revelation. God reveals Himself to man, and the substance of this revelation is passed on through scripture and oral tradition. This sacred legacy, moreover, comprises two aspects: a Truth, namely, and a Way; and the two are complementary, which is to say that each implies or presupposes the other. Strictly speaking, therefore, the truth of a religion can be gauged only by those who have progressed upon its way of sanctification; no religion can ever be adequately comprehended "from the outside".

2. Do you see any conflict between your definitions of these two concepts?

While there is no antagonism between science and religion in the sense of an inherent contradiction or incompatibility, conflict does arise on account of certain mental limitations and various false ideas. Scientists, for their part, have generally erred by failing to realize that their methods of inquiry give access, not simply to reality as such, but only to certain levels or aspects, as I have said before; and thus they tend to espouse a reductionist world view. In effect, one maintains that whatever cannot be comprehended by scientific means must *ipso facto* lack objective status and pertain consequently to the subjective domain. One may very well admit that such "fantasies" can indeed be useful or even necessary to human life; and yet the ontological denial remains in force. Such, in essence, is the prevailing scientistic attitude towards the phenomenon of religion; as Einstein once put it: "Science deals with what *is*, religion with what *ought to be*". But clearly, this position amounts to an outright rejection of religious truth as understood "from within". And the response by theologians in the West has been for the most part pathetic. Awed into submission, many have set about to re-interpret religious doctrine along more or less subjectivist lines, thereby reducing religion in effect to a kind of psychotherapy or social activism, as the case may be. Religion in the West has thus become increasingly divided into a traditional and a modernist camp. It needs however to be clearly understood that a secularized religion is in reality no religion at all, but can only be a profane and more or less trivial counterfeit. And I would add that few things in the world are more insipid and boring than an "updated" church.

3. Where do you think there may be a conflict between these two?

As I have already indicated, the primary cause of conflict between science and religion lies, I believe, in the scientistic tenet of reductionism. To be more specific, it lies fundamentally in the belief that all objectively existent things are in reality "nothing but" aggregates of molecules or subatomic particles. This, in a nutshell, is the ontological premise that is being disseminated in our schools and universities as a scientific fact. However, as I have argued in my recent book, *The Quantum Enigma*, the tenet derives in reality from a philosophic postulate introduced by René Descartes, which is in principle unverifiable, be it by philosophic or scientific means. It turns out, moreover, that the seeming paradoxes of quantum theory which have prompted physicists to propose various new and strange world views - such as the truly bizarre "many worlds" hypothesis - can in fact be traced to the reductionist premise, which physicists habitually (and gratuitously!) presuppose.

It is important to note that this primary scientistic fallacy gives rise to and underpins other scientistic beliefs, which are no less spurious and no less antagonistic to religion. The most important case in point is doubtless the tenet of Darwinism, which once again is reputedly founded upon scientific facts. However, as many have come to realize by now, this is actually not the case. On the contrary, as I have pointed out elsewhere, one requires various *ad hoc* hypotheses, each as improbable as the Darwinist thesis itself, to shore up the theory in the face of plainly hostile facts. I contend that scientists accept Darwinian evolution, not on the strength of scientific evidence, but because the reductionist premise leaves no choice in the matter; after all, in a universe consisting ultimately of subatomic particles and nothing else, no other means of biogenesis and speciation can evidently be conceived.

When it comes to first origins, be it of life, of species, or of the universe in its totality, the methods of science prove finally to be inadequate. This, to my mind, is what the discovery of the initial singularity or so-called big bang demonstrates in the domain of cosmogenesis: there is invariably a limit in the investigation of origins beyond which the methods of science cannot be applied. The conflict between science and religion will abate, I believe, once scientists learn to recognize and respect these natural and inevitable bounds.

4. What have been the grounds for the development of conflict between these two?

It follows from what has already been said that the conflict between science and religion stems mainly from a failure on the part of scientists to distinguish clearly between scientific facts and scientistic beliefs. It is this lack of philosophic clarity, this intellectual confusion, that accounts for the fact that scientists have promulgated philosophic opinions of the most dubious kind as established scientific truths, and in the name of science have thrust upon an awed and credulous public a shallow world view for which in reality there is not a shred of scientific support. Having gained the trust and admiration of society by virtue of the technological wonders over which they dispose, scientists as a class have usurped their authority by predisposing the public against the truths of religion. I am not suggesting, of course, that they have consciously deceived others, but rather contend that they have themselves been misled in matters pertaining to philosophy, metaphysics and religion. Meanwhile these "blind guides" are exerting an inestimable influence upon education and public belief, with disastrous consequences to human welfare, both here and hereafter.

5. What has been the role of religion in the development of science in the West?

I am not enough of a historian to answer this question in detail, or with complete assurance; but it has often been claimed that the roots of science in the West lie in theology. It is not difficult to see, moreover, that the twin concepts of natural law and the intelligibility of the universe - down to its smallest parts - could well have been inspired by theological speculations. After all, a world "made" by the Logos, the Word of God, could hardly be chaotic, haphazard, or unintelligible. One also knows that the founders of Western science were steeped in religious belief, and that Newton, for one, devoted much of his later life to theological studies. Moreover, despite the widespread atheism presently to be found in the West, it is worthy of note that some of the greatest scientists of our century did believe firmly in God and draw scientific inspiration from that belief, as was the case, for instance, with Albert Einstein, Max Planck, Niels Bohr and Erwin Schrödinger.

6. Can we have a religious science?

In as much as there is no intrinsic conflict between science and religion, it is certainly possible to be both a religious believer and a scientist, or to put it more emphatically: to be fully a religious believer and fully a scientist. Moreover, given the fact that Nature reflects the Wisdom of God, and that all natural law is ultimately grounded in the divine Principle, it is clear that a man of religious faith can very well draw inspiration from the practice and findings of science. Enlightened by sacred doctrine, he may indeed attain to a far deeper understanding of what science has unearthed than is possible from a profane or secular point of view. I am fully convinced that science, restricted to its own level, is in fact unable to comprehend the higher meaning or metaphysical significance of its own discoveries.

7. Can science dispense with religion?

As the cosmos itself does not stand in separation from God, so too science cannot for long stand and prosper in separation from religion. If indeed its roots lie in theology, as we have said, it is hardly surprising that science needs periodically to draw sustenance from that ground if it is not to wither and eventually die, or what amounts to the same: degenerate into a merely technological enterprise. One might add that a number of scientists, beginning with Albert Einstein, have in fact voiced concern that science may now be heading in that direction: that the erstwhile quest for truth may give way to an unmitigated pursuit of power. One thing, however, is clear: if and when this reduction shall be accomplished, there will no longer be an Einstein or a Heisenberg, or indeed a creative scientist of first rank; only technicians, monotonously plying their trade.

8. Can one separate the domains of activity of science and religion completely?

As we have already indicated, the domains of science and religion cannot be separated completely without serious detriment to both. It is in fact the separation which did take place in the West following the collapse of medieval Christendom that has resulted, as we know, in the tensions which presently afflict and threaten not just the West, but mankind as a whole. The spread of scientistic ideologies and the abuses of industrialism, however, may not be the last word in this evolution; something else, far more subtle, is beginning to emerge, which may indeed require the full resources of traditional metaphysics for its adequate elucidation. It was the French metaphysician René Guénon who forecasted more than half a century ago that modern "anti-tradition", which had been rampant in the West since the so-called Enlightenment, would give way to what he termed the "countertradition", a seeming revival of religious beliefs and sacred traditions which in reality is quite the opposite. It is to be noted that less than two decades after Guénon made this prediction, Western society was startled by the cultural explosion of the sixties, which began in England and the United States, and has since spread over much of the globe. We will not attempt, at this point, to delineate this multifaceted movement, with its various counter-cultures, its drug cult and rock music, its sexual aberrations, its militant feminism, its barbarized "yogas", its pseudo-spiritualities and so-called New Age ideologies; suffice it to say that it is this - and not the crude materialism of bygone days - that now threatens society. And whereas numerous manifestations of what may loosely be termed the New Age movement are plainly subversive, it is only in light of traditional data that the anti-traditional thrust of its more refined and "respectable" aspects can be discerned. I would add that various religious traditions, in the East and in the West, have predicted a phenomenon of this kind (often in almost identical terms!), and have depicted "the latter days" as a period of great trials, when false prophets shall appear in abundance and vast segments of mankind shall be deceived. We do not know exactly when this apocalyptic scenario will be realized, or whether perhaps it may have already begun; permit me however to recall a dictum which is to be found in many traditions, from our own "vincit omnia veritas" to the Hindu "satyam eva jayate": Truth alone will triumph in the end. As one reads in the Qur'an: "Truth has come and falsehood has perished".

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Publications: More than 300 books on traditional and rational sciences.

1. How do you define science and religion?

Definition of religion

We first define religion (din) and then science ('ilm)

The term "din" is Arabic and has various usages. The sense used in daily conversations denotes "belief in God" along with a set of ideas.

If we want to define it, we could define it as belief in a being with unlimited knowledge and power Who created celestial and terrestrial entities in an organized fashion, and chose human beings from among all those creations, and sent educators to show them the freeways to salvation, activating all the potential merits hidden in their nature, and warning them against the positions of error. God has set rewards and punishments—for following, or not following, the religious teachings sent through special messengers—which human beings will face in their second life (the hereafter). In other words, religion (din) is belief in an unseen power which is unlimited in perfection, whose essence is unknowable to humankind, except through its features, namely, the attributes of its essence and deeds. We may refer to knowledge and power as the attributes of His essence and to purposefulness as an attribute of His deeds. Thus, the universe and human beings have been created with a purpose for which positive results affect those very creations, not that of the divine essence. From this, we may conclude that life in this world is not the goal [of creation], but a step towards a higher end and life. God has sent the following message to his worshippers through His last [human] educator:

"مَا هَذِهِ الْحَيَاةُ الدُّنْيَا إِلاَّ لَهْوٌ وَلَعِبٌ وَإِنَّ الدَّارَ الآخِرَةَ لَهِيَ الْحَيَوَانُ لَوْ كَانُوا يَعْلَمُونَ"

> "This present life is nothing but a diversion and a play; but the abode of the Hereafter is indeed Life, had they known". (29:64)

Since our aim here is to define religion, not to prove the truth of religion, this much will suffice for defining and making it known. The question of whether that unseen Being with those attributes really exists or not belongs to the realm of philosophy and theology. However, even those who do not have such knowledge can find the truth in simple ways, the clearest of which is through the guidance of human nature and thinking about the organization of this perceptible world, which indicates the role of knowledge and power in the creation of both human nature and this world.

Definition of 'ilm (science/knowledge)

The term 'ilm (science/knowledge), which is [also] rendered as "danesh" in Persian, has various meanings or so called "applications", and even includes such areas of non-experimental knowledge as literature and law. In these questions, however, we are concerned with natural sciences, including celestial and terrestrial ones, whose objects of study exist outside and independently of the thinkers' minds and conception, objects whose existence outside the mind is confirmed by everyone except skeptics and idealists. Thus, science can be defined as the discovery of the dynamics of the structure of the world and making known the laws and organization of the world, and that is why we now know that the system governing the atom is the same as that which governs the galaxies.

Here I am compelled to say that: from the first day that discoverers and inventors started doing research with extremely simple tools, they took one principle for granted: that the object of their investigation is governed by a certain order and organization which is to be discovered with patience and tolerance, and if had they not unanimously agreed on that principle, they would never have investigated anything or used simple tools, or what is now called a laboratory. This definite principle helped them tolerating the pains and ignoring the pleasures of life for the sake of discovering the unknown.

2. Do you see any incompatibility between your definitions of science and religion?

If we clearly know the realms of science and religion and understand that these are not parallel areas but are collinear, we see that there is no conflict between them. Instead, based on our definitions of science and religion, science is at the service of religion and discovers the hidden organization of the world. If we want to explain their being collinear, we should say that religion concerns the things per se while science concerns proving or disproving their qualities, functions and features.

Religion declares that this world has not been created accidentally but was created in an organized form by a knowing and powerful Being, with His unlimited knowledge and power, as He says in the Qur'an:

"وَيَتَفَكَّرُونَ فِي خَلْقِ السَّمَاوَاتِ وَالأَرْضِ رَبَّنَا مَا خَلَقْتَ هَذَا بَاطِلاً سُبْحَانَكَ فَقِنَا عَذَابَ النَّارِ".

> "[Those] who remember Allah, standing, sitting, and lying on their sides, and reflect on the creation of the heavens and the earth [and say]: 'Our Lord, You have not created this for vain! Immaculate are you! Save us from the punishment of the Fire.'" (3: 191)

In this way, scientists in all ages have sought to uncover with their special tools and words the hidden laws of the book of nature, referred to by religion.

3.Where do you think they can conflict with each other?

It is possible that they conflict with each other in two situations, but only apparently, not actually.

1. A conflict may occur when the position of religion about the creation is not correctly presented; that is, when all sorts of cause and effect relationships between celestial and terrestrial phenomena are rejected and only one cause is recognized, i.e. the Creator replaces all other causes. For instance, when the [cause and effect] relationship between fire and the burning of cotton or between water and slaking one's thirst is denied. In such a situation, science, whose function is to uncover the relations between entities, criticizes religion and calls it "anti-science." This view of the role of religion in the world of creation is caused by a misunderstanding of the unity of God in the act of creation, which is stressed by the divine Book. These people have not properly read or comprehended the divine Book while the Holy Qur'an, as the last divine Book, describes the creation as being governed by cause and effect relations, recognizes material causes, and considers all of them as divine traditions. For the sake of brevity, we refer to two verses here:

"وَأَنْزَلَ مِنَ السَّمَاءِ مَاءً فَأَخْرَجَ بِهِ مِنَ الثَّمَرَاتِ رِزْقًا لَكُمْ".

> "and He sends down water from the sky, and with it He brings forth crops for your sustenance." (2: 22).

This verse clearly speaks of water as the cause of the growth of trees and plants and their crops.

> There are verses in the Qur'an which speak about the formation of clouds and rain and explicitly refer to interaction between substances, which cannot be further explained here. Only one verse and its translation will be given here, and we ask the readers to ponder over its content:

"أَلَمْ تَرَ أَنَّ اللهَ يُزْجِي سَحَابًا ثُمَّ يُؤَلِّفُ بَيْنَهُ ثُمَّ يَجْعَلُهُ رُكَامًا فَتَرَى الْوَدْقَ يَخْرُجُ مِنْ خِلَالِهِ وَيُنَزِّلُ مِنَ
السَّمَاءِ مِنْ جِبَالٍ فِيهَا مِنْ بَرَدٍ فَيُصِيبُ بِهِ مَنْ يَشَاءُ وَيَصْرِفُهُ عَمَّنْ يَشَاءُ يَكَادُ سَنَا بَرْقِهِ يَذْهَبُ
بِالْأَبْصَارِ".

> "Have you not seen that Allah drives the clouds, then He composes them, then He piles them up, whereat you see the rain issuing from its midst? And He sends down from the sky hail, out of the mountains that are in it, and He strikes with it whomever He wishes, and turns it away from whomever He wishes. The brilliance of its lightening almost takes away the sight." (24: 43)

These two verses and many others explicitly refer to the cause and effect relationships in the world of creation, and all of them are divine traditions, created by power and knowledge in the nature of the created entities. If anyone or any group rejects the order in the world of creation, he has helped the generation of conflict between science and religion.

2. The second situation in which conflict may appear between science and religion is where those who claim to possess scientific knowledge take theories as certain knowledge, and then claim that there is conflict between science and religion, while the relevant scientific data are shaky and uncertain. When Darwin proposed his theory of the "evolution of species" and extended it to include human beings as well, the emerging materialists were absolutely exited and thought that Darwinism, which was founded on four principles, was a decisive discovery. Before long, however, all those principles were rejected, and a theory called "Neo-Darwinism" emerged, which didn't last long either and was replaced by a third theory called "mutation", and so on and so forth.

Therefore, conflict between science and religion could arise in two situations: either a researcher's understanding of religion is wrong or the scientific, ideas which are still theories and have a long way to consolidate into facts, are taken as definite principles.

4. What made for the growth of conflict between science and religion?

Here We should differentiate between two things:

1) The reasons for the development of materialism in the west
2) The reasons for the growth of conflict between science and religion.

We have intensively talked about the first issue in The Way to Know God, but we shall briefly explain some of the reasons here. . Such descriptions of religion and God lead to results which are contrary to what one expected and make people avoid and deny religion.

1. **Misleading and fanciful explications of God.** For example, on the basis of the Old Testament's reference to Jacob's wrestling with God[1], some Christians, in their early life, believe in an anthropomorphic God, but when they learn and practice science, that anthropomorphic image of God does not agree with logical reasons and scientific concepts. As a result, after a while, their hope of any compatibility [between science and religion] is lost, and the concept of God is thoroughly abandoned and forgotten

2. **Lack of right philosophical schools in the west.** Bertrand Russell, for instance, says that he believed in God for a long time but changed his belief altogether later because he thought if everything were supposed to have a cause and creator, God, too, should have a cause and creator[2].

3. **Replacement of thinking by experimentation.** Because metaphysics does not belong to the realm of experiments, it was naturally denied, and, of all means of gaining knowledge, only experiments were trusted.

4. **Revenge on inquisition.** Scientists who proposed new theories were frequently prosecuted [by the church]. Galileo's trial is well-known in the history of science. These issues and similar ones led to the spread of materialism in the west.

Here we present two reasons for the growth of conflict between religion and science.

A. The tumult of Darwinism

Darwin's theory of the evolution of flora and fauna was an important factor in the appearance of the idea of conflict between science and religion. The evolution of species, the so-called "transformism" ,was not Darwin's exclusive achievement. Before him, Lamarck, and, before Lamarck, two others had briefly presented this issue in Greek philosophy. Darwin's role in the dissemination of this idea was effective because he proposed it at a time when the scientific world was ready to accept it.

Darwin generated a great controversy in the scientific circles of the west by publishing his Origin of Species. However, while he called himself an agnostic in the final years of his life, the enemies of religion abused his shaky theory against religion. The theory of the evolution of species, whether gradual or sudden evolution, was incompatible with the contents of the Bible, which takes all human beings as the descendants of Adam and explicitly declares that Adam was created of dust. For some people, this theory created a conflict between science and religion.

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[1] The Bible, King James Version, Genesis, Chapter32 (Oxford University Press,1997), pp. 39-41.

[2] Russell, Bertrand, Why I am not a Christian? (Routledge: 1957) p. 4.

B. Collapse of many scientific theories

Ptolemy's theory of the creation of heaven and earth powerfully worked for about 1500 years, and the ideas of Greek scientists were taught in the scientific centers as was the contents of the Bible. These ideas had penetrated so much the hearts of scientists that some Muslim interpreters [of the Qur'an] came to believe in the authenticity and strength of Ptolemy's theory and interpreted many Qur'anic verses on its basis. But with the start of Renaissance in Europe, this theory was undermined by four famous scientists. So, those who had taken that theory as a religious and divine idea, started to talk about the conflict between science and religion.

These two factors were given as examples of the causes of the growth of conflict between science and religion. But other factors were also involved in creating a distance between science and religion which we won't explain here.

5. What is the role of religion in the development of science in the west?

There are two theories about the creation of the world. We need to see which one could help the development of science.

1. First Theory

The material world or nature has been created by the will of a knowledgeable and powerful Being and continues to exist on the basis of a series of traditions and secret laws which can be partly uncovered by researchers. Also the creation of this world, as God says in the Qur'an, was purposeful:

"أَفَحَسِبْتُمْ أَنَّمَا خَلَقْنَاكُمْ عَبَثًا وَأَنَّكُمْ إِلَيْنَا لَا تُرْجَعُونَ"

> "Did you think that We created you aimlessly, and that you will not be returned to Us?" (23:115)

2. Second Theory

The beginning and end of the world of nature are not known, and the origin (i.e., occurrence and emergence) of the creation is completely unclear, as is its end. The world is like a manuscript whose first and last pages are missing and is ambiguous, and whose author cannot be specified.

Now the question arises as to which of these two theories stimulates the researcher's sense of curiosity to forget about resting and eating and working around the clock. Definitely, the first theory, because discoverers and inventors, before starting any debate or investigation, admit that a natural object has its own secret and organization which could be found with patience, while there is no such assumption in the second theory.

Now we are not concerned about which of these two theories is right and which group of scientists have the right thoughts. What concerns us here is to see which one of these thoughts stimulates our sense of curiosity to discover the secrets of nature: the idea that the creation of the world was governed by thinking and that nature was created on the basis of a plan and measurement or the idea that the world was created by the collision of countless atoms, involving no thinking and not even a little foreknowledge and measurement, and its assumed order is just an accident.

It goes without saying that it is only the first thought which could help the attempts to discover the secrets and laws of nature. Unless a discoverer believes deep in his heart that the creation works on the basis of an order, a plan and a chain of cause and effect relationships as well as regular laws, he will never tolerate the pains of research and study. Such a belief is created only as a result of faith in God, but this belief is not possible in materialism.

Therefore, it could be said that some of those materialists who spend their lives in laboratories to discover the laws and secrets of nature and have no goal except the discovery of the unerring laws of nature are theistic people deep in their hearts even though they claim to be materialists. Based on this, it is clear why **Einstein** considered religion as the generator of science and theories when he says:

> *"I maintain that cosmic religious feeling is the strongest and noblest incitement to scientific research."*[1]

He also believes that the idea of the intelligibility of the world originates in religion:

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[1] Einstein, Albert. The World As I See It. (Citadel, 2001), p. 21.

> *"To this [sphere of religion] there also belongs the faith in the possibility that the regulations valid for the world of existence are rational, that is comprehensible to reason. I cannot conceive of a genuine scientist without that profound faith. The situation may be expressed by an image: science without religion is lame, religion without science is blind."*[1]

What necessity and conception of the organization of the world and what zeal gave power and energy to Kepler and Newton to take pains on their own in silence for years in order to explain and demystify gravity and the celestial system? We believe that it was divine religions that primarily caused the emergence of modern science. As the prominent physicist **Paul Davies** puts it:

> *"It was from the intellectual ferment brought about by the merging of Greek philosophy and Judeo-Islamic-Christian thought that modern science emerged, with its unidirectional linear time, its insistence on nature's rationality, and its emphasis on mathematical principles. All the early scientists, like Newton, were religious in one way or another. They saw their science as a means of uncovering traces of God's handiwork in the universe. What we now call the laws of physics they regarded as God's abstract creation: thoughts, so to speak, in the mind of God. So in doing science, they supposed, one might be able to glimpse the mind of God-an exhilarating and audacious claim."*2

This wide-ranging argument reveals that belief in God has played an effective role in the development of science in the west and across the world.

6. Can we have a religious science?

In order to answer this question, we should clarify the meaning of science. If by science we mean all sorts of awareness and knowledge, including the contents of divine Books and the teachings of infallible educators, we could classify science and call part of it religious. This kind of religious knowledge, however, has no conflict with science and should not be considered as opposition to science.

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[1] Schilpp, A. P. Albert Einstein: Philosopher–Scientist. (La Salle, Ill.: Open Court, 1970), p.285.

[2] Paul Davies, "Physics and the Mind of God": The Templeton Prize Address", First Things, 55, August/September 1995, p. 32.

As we noted earlier, however, by "science" here we mean natural sciences, whether dealing with celestial objects or terrestrial. Therefore, we cannot classify science into two types. Physics and chemistry, which both concern the external and internal effects of matter are science: they have neither a religious nor a nonreligious character. The multiplication Table of Pythagoras and other tables are part of the science humankind has acquired and have no particular character.

What we may say here is that divine Books and the words of divine educators expressed a series of truths about human beings and nature which had not been accessed by science before. Fortunately, this fact has received attention by Muslim scientists for more than a century. I give two examples here.

1. Universal pairing

In the past, scientists believed that pairs existed in the world of animals only while the Qur'an says that this fact of creation (i.e., male-female pairing) applies to plants as well:

"وَمِنْ كُلِّ الثَّمَرَاتِ جَعَلَ فِيهَا زَوْجَيْنِ اثْنَيْنِ"

> "and of every fruit He placed there two kinds." (13:3)

In another verse, God says:

"سُبْحَانَ الذِي خَلَقَ الأَزْوَاجَ كُلَّهَا مِمَّا تُنْبِتُ الأَرْضُ وَمِنْ أَنْفُسِهِمْ وَمِمَّا لاَ يَعْلَمُونَ"

> "Immaculate is He who has created all the kinds of what the earth grows, and of themselves, and what they do not know." (36:36)

And, in another verse, He extends the notion of pairing to everything:

"وَمِنْ كُلِّ شَيْءٍ خَلَقْنَا زَوْجَيْنِ لَعَلَّكُمْ تَذَكَّرُونَ"

> "And in all things We have created pairs so that you may make admonition." (51:49)

2. The roundness of the earth

There are many verses which prove the roundness of the earth. We provide one example here.

"وَأَوْرَثْنَا الْقَوْمَ الَّذِينَ كَانُوا يُسْتَضْعَفُونَ مَشَارِقَ الأَرْضِ وَمَغَارِبَهَا"

> "And We made the people who had been persecuted and oppressed to inherit all the easts and wests of the land..." (7: 137)

If the earth were flat, there would be no more than one east and one west, whereas this verse speaks of easts and wests, which has a clear meaning. If the earth is round, when the sun rises in one part, it will necessarily set in another. Therefore, it would not be possible to have a number of easts and wests without assuming the roundness of the earth.

These were only given as examples here. Such scientific reports, which were not available in the age of the revelation of the Qur'an, could be described as religious science, although, as noted above, the act of discovering the truths and uncovering nature cannot be called religious or nonreligious. But if we consider science under a monotheistic worldview, then all human knowledge can be called religious.

7. Can science ignore religion?

The answer to this question could be found in the argument about the role of religion in the development of science. If the researcher is not certain about the existence of order in nature, he cannot start research, as the belief in the organization of the world is not separate from belief in God Who created the world on the basis of certain laws. No matter how much science tries, it cannot ascertain the origin and end of creation and will have to resort to religion to reveal these two facts to us, on the basis of special arguments.

8. Can we completely separate the realms of science and religion?

Since the goal of science is to discover the secrets and hidden laws of nature, the realms of science and religion will necessarily not be separate, because attempting to discover the organization of the world is not disconnected from the belief in the creator of that organization. Thus, we should say that science is at the service of religion and belief in God.

Prof. Russell Stannard

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Education: University College London; B.Sc. (1953); Ph.D. (1956).

Positions Held: Research assistant, UCL (1956-9); Physicist, Lawrence Radiation Laboratory, Berkeley, California (1959-60): Lecturer, UCL (1960-9); Professor of Physics, Open University (1969-97); Visiting Fellow, Center of Theological Inquiry, Princeton (1987-8); Vice-president, Institute of Physics, UK (1987-91); Reader in Church of England (1966-present); Trustee, John Templeton Foundation (1993-present).

Awards: Rosa Morrison Medal, UCL (1953); Templeton Project Trust Award (1986); OBE (1998); Emeritus Professor of Physics,Open University (1999); Bragg Medal of the Insitute of Physics (2000); Fellow of University College London (2000).

Professional Interests: High energy nuclear physics, cosmology, the relationships between science and religion; and the public understanding of science, particularly the need to interest children in science.

Publications: Over 60 scientific papers; 23 books, 40 television, and over 100 radio programs.

1. What is your definition of science and of religion?

Science is the study of the physical world and of ourselves as objects within that world. It is based on close observation of nature and is our best attempt so far to make sense of the results of those experiments.

Religion embraces all aspects of our relationship with the Divine. This relationship is a personal one and involves living one's life as we believe God intended us to do. Theology is our best attempt so far to describe the God we encounter in religious experience.

2. Do you see any conflict between your definitions of these two concepts?

None at all. To a large extent, they address different issues. One is concerned with the way the world operates - its physical behaviour; the other with human and Divine purpose and what might lie beyond the physical. Roughly speaking, science deals with the "how" type question, religion with the "why". Which is not to say there is no contact at all between these two domains of concern. I return to this topic later.

3. Where do you think there may be a conflict between these two?

I do not see how there can be any *genuine* conflict between science (the study of God's creation) and religion (involving as it does the study of God the creator). Any apparent conflict is an invitation to deepen our understanding of the science, or of God, or of both, in order to resolve the supposed incompatibility. Seeming conflicts that arise within the pursuit of science itself are never regarded as undermining the scientific endeavour; instead, they are seen as exciting opportunities to advance our understanding still further. In the same way, whatever is perceived as a conflict between science and religion should be welcomed as a springboard to an enriched understanding of God and the way God has chosen to operate in the world.

4. What have been the grounds for the development of conflict between these two?

The so-called conflicts mainly arise from misunderstandings. For example, the perceived conflict in some quarters between evolutionary theory and the Adam and Eve story comes about through a misconception of the true intention behind the Genesis writings. They are concerned with timeless spiritual truths; they were never intended as a rival scientific account of our origins.

Again, the view that religious and other modes of thought are unnecessary and irrelevant – science being the only reliable route to knowledge – is based on an erroneous assumption (scientism) regarding the scope of scientific investigation, and the firmness of its conclusions.

5. What has been the role of religion in the development of science in the West?

I am not myself a historian of science, but as I understand the situation, science, as we know it, would not have got going without shaking off the old Greek philosophical view that one could work out how the world must be through thought alone; the world was the way it was because that was the way it *had* to be.

In contrast, the religious view held that the world exists only because God decided to create it. He *chose* to create the world; it did not have to be. The world being contingent, one cannot expect to be able to deduce its nature from some supposed set of first principles. Instead, one must look at the world to see which one God decided to create. In other words, one must experiment. This religiously inspired shift towards granting primacy to experimentation, rather than to the supposed aesthetic appeal of some theory, led to the type of science developed in the West.

6. Can we have a religious science?

Certainly, one can look upon the development of science as the process of thinking the Creator's thoughts after him. In that way, the scientist who is a religious believer will hold that his or her work is integrally bound up in the religiously observed life.

Not only that, but in the application of science to the devising of new products, we become co-creators with God, with all that entails. In particular, this newly found power must be exercised in a morally responsible manner – that moral sense for most people being derived directly or indirectly from a religious source.

7. Can science dispense with religion?

Individual scientists can indeed practice their science without being religious. That much is obvious from the professional success of certain avowed atheists. Which is not to say that science *should* dispense with religion.

8. Can one separate the domains of activity of science and religion completely?

Although, as I said earlier, science and religion in the main address different kinds of question – conveniently but somewhat crudely labelled "how?" and "why?" – the domains are not entirely separate.

For example, many physicists are led by Einstein's theory of relativity to accept the idea of a *block universe*. This maintains that future and past events exist on an equal footing with those occurring at the present instant. If this is the case – if it is true that in some sense the future exists – then this surely makes it easier to accept the orthodox Christian view that God knows the future; he has foreknowledge.

A second example arises out of the Big Bang theory of the origins of the universe. This holds that there was no time before the Big Bang. This being so, one cannot think of the Big Bang as having a "cause" in the normal sense of that word – the cause having to precede the effect. Thus we cannot think of God as existing "before the Big Bang". This forces some people to rethink how they are to understand God as the Creator.

In fact, no difficulty arises once one realizes that the Big Bang is all to do with "origins" – the mechanics of how the world originated, or got started. "Creation", on the other hand, is concerned with a different kind of question altogether: "Why is there something rather than nothing?" It is seeking the ground of all being – that which is responsible for all existence. As such, it is as much concerned with what exists at this present instant as at the first instant.

Not that there is anything startlingly new about the realization that there was no time before there was a world. St. Augustine had long ago worked out that time was as much a property of the world as any other, and must have been created along with everything else.

As an example of how theological thinking might have played a seminal role in the development of a scientific theory, consider how the Danish physicist Niels Bohr dealt with the various paradoxes thrown up by quantum physics. These included the question of how an electron could be both a tiny localized particle, as certain experiments indicated, and also a spread-out wave, which seemed to be the conclusion to be drawn from other types of observation. Bohr proposed that scientific statements in truth do not describe how the world is in itself; it is meaningless to ask what the electron *is* – wave or particle. Rather, science describes our interactions with, or observations of the world. These yield particle-like or wave-like answers depending upon the type of investigation; at the same time, there is no call to use the particle and wave descriptions simultaneously – hence the incompatibility can be regarded as resolved.

How did Bohr arrive at this radically new perspective on the problem? It is hard to say, but what is well known is that he was an avid reader of his compatriot, the Danish theologian Soren Kierkegaard. The latter wrote much about the paradoxes arising out of Christian theology concerning the trinitarian nature of the one God, and how Jesus could be both fully man (with all the limitations one associates with being human) and fully God (omnipotent, omnipresent, etc.)? What was his solution? He declared that when the truth, thought of as something objective, appeared to be paradoxical, this was an indication that we should be seeking a more subjective kind of truth - one involving our own active participation, our own interaction. He was advocating that we should be concentrating on our interactions with God, rather than trying to describe God in himself. This of course, is very similar in form to the solution that Bohr came up with in connection with the paradoxes of the electron's nature. It is quite a thought that modern quantum physics might have been inspired by a nineteenth century theologian!

Prof. Mikael Stenmark

Date of Birth: Dec. 25, 1962 (Umea, Sweden)

Education: Bachelor of Arts (1989), Bachelor of Divinity (1993), Ph.D. in Philosophy of Religion (1994) Uppsala University.

Post-Doctoral Professional Experience: Lecturer in Philosophy of Religion (1995-2002). Professor in Philosophy of Religion (since 2003), Uppsala University. Guest researcher at the Chicago Center of Science and Theology (1995).

Primary Research Fields: Philosophy of religion, science and religion, environmental ethics.

Publications: More than 20 articles and five books including: *Rationality in Science. Religion and Everyday Life: A Critical Evaluation of Four Models of Rationality* (Notre Dame, Indiana: University of Notre Dame Press, 1995), *Scientism: Science, Ethics and Religion* (Aldershort: Ashgate, 2001) and *Environmental Ethics and Environmental Policy Making* (Aldershort: Ashgate, 2002).

Awards: The John Templeton Foundation Prize for Outstanding Books in Theology and the Natural Sciences, 1996; The Oscar Prize, Uppsala University, 1998.

1. What is your definition of science and of religion?

Science is the attempt to understand the constitution and causes of the natural world by means of experimentation and observation undertaken in such a way that its results should in principle be intersubjectively testable.

Religion, broadly conceived, is whatever people do to come to grips with their existential concerns, that is, their questions about who they are, why they exist, what the meaning of their life is, and what stance they should take towards experience of death, suffering, guilt, love, forgiveness and so forth. Religion is the attempt to solve what it means to exist in the world as a human being. Characteristic of religions such as Christianity and Islam is that they contain the idea that it is possible for us come to grips with our existential concerns in a more profound way only if we let our lives be transformed by God, or if we enter into a right relation with the divine.

2. Do you see any conflict between your definitions of these two concepts?

I see no conflict between these definitions. However, even if the activities that these concepts define have different aims and functions in human life, we cannot exclude the possibility that they could generate or contains elements (beliefs, values, stories, theories, and the like) which could contradict each other. This would be the case if, for instance, religious convictions either have an empirical content or presuppose the truth of some empirical claims.

3. Where do you think there may be a conflict between these two?

This is a difficult question to answer because it depends on what particular beliefs and values a specific religion contains, and this varies greatly among the world religions. But as a rule of thumb, we could perhaps say that the closer we get to the questions about what is distinctively human, the greater the chances are for potential conflict (or confirmation).

4. What have been the grounds for the development of conflict between these two?

My guess is that the traditional grounds for the development of conflict have simply been that religions have contained a variety of empirical claims or been interpreted to include a variety of empirical claims and that science has shown many of these to be false. Another reason has simply been that many people have not understood that science and religion have two different missions (see question 1).

5. What has been the role of religion in the development of science in the West?

This is really a question for scholars working in the area of the history of science; and, since I have not done any work in that field, I am in no position to offer a well-reasoned answer to it.

6. Can we have a religious science?

We could have a religious science but the interesting question is, I assume, whether we *should* have such a science. If the idea is merely that religion ought to shape science when it comes to the direction and application of research, I think it is important that religious values and beliefs – and not merely secular and atheistic ones – are allowed to influence science. But I am more doubtful when it comes to the justification of scientific theories. To the extent that it is possible I believe that science should be an enterprise in which religious (or atheistic) beliefs and values are not allowed among the grounds for accepting or rejecting theories because otherwise the idea of science as a universal enterprise in which people could be a part of regardless of which ideology or religion they cherish is totally undermined.

7. Can science dispense with religion?

Yes, but not people, because they need a practice that help them deal with their existential and moral concerns.

8. Can one separate the domains of activity of science and religion completely?

No, because there is always a possibility of intersection between the two domains. However, if religion is entitled to shape the direction and application of scientific research (see question 6), then non-separation (or integration) is not merely a possible but also a desirable state of affair.

Dr. William R. Stoeger

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Education: A.B. in Philosophy and Physics (1967), Spring Hill College; M.S. in Physics (1969), University of California at Los Angeles; S. T. M. (Theology) 1972, Jesuit School of Theology, Berkeley, California; Ph.D. in Astrophysics (1979), University of Cambridge.

Postgraduate Experience: Lecturer in Physics (1969), University of San Francisco; Visiting Astronomer (1975), Vatican Observatory; Staff Astronomer (since 1979), Vatican Observatory; Faculty Research assistant in Physics and Astronomy (1977), University of Maryland; J.K. Russell Fellowship (1988-89), Center for Theology and Natural Sciences, Berkeley, CA; Adjunct Associate Prof. of Astronomy, University of Arizona (Tusson, Arizona).

Discipline: Physics and Astrophysics; Philosophy and Theology.

Selected Publications: Over 45 publications.

1. What is your definition of science and of religion?

By "science" I mean the natural sciences, as they are now practiced - astronomy, physics, chemistry, biology, experimental psychology, and their sub-disciplines. These investigate the regularities, processes and structures of physical and biological reality insofar as they can be subsumed under general laws. This is pursued by the interactive procedure of constructing models or theories and of performing properly designed experiments and observations to test them. The hypothetico-deductive method is central to this procedure. As a result, our models and theories of the regularities and structures of the material world are gradually refined and improved, though they always are provisional, and will never be fully adequate. They thus constitute a detailed description of the make-up of the objects and relationships which constitute reality as we know it, and, to some extent provide limited explanations for the way it behaves.

"Religion" is a much more difficult word to define. I insist on carefully distinguishing among "faith", "theology", and "religion". All of these are related, but they are all different from one another. "Faith" is essentially our positive individual or communitarian response in acceptance of and commitment to perceived divine revelation. "Theology" is our ongoing reflection on that perceived divine revelation, and most importantly on the individual and communal experience of living out our commitment to and acceptance of it. "Religion", strictly speaking, is the organized, institutional social embodiment of a believing community gives to its particular discernment and articulation of divine revelation, and to its ways of living, praying, working, and relating to God, to the world, and to one another in that shared faith commitment.

2. Do you see any conflict between your definitions of these two concepts?

No, there is no essential conflict between my definitions of "science" and of "religion" (or "faith" or "theology").

3. Where do you think there may be a conflict between these two?

A conflict can occur between science and religion, when one or the other oversteps the proper limits of its own competency and infringes those of the other. For instance, if religion or theology interprets the perceived revealed truth to affirm something about the natural world which contradicts what the natural sciences have discovered, then we have conflict. Or, going in the other direction, if the natural sciences conclude, or claim that they can conclude, to statements about God or God's activity, or values, or what is right and wrong, then there is potential for conflict with religion.

4. What have been the grounds for the development of conflict between these two?

Specific examples of what I have mentioned above would be: 1. Religion claiming that revelation dictates that the structure and organization of the universe is one way, whereas the natural sciences discover it to be another way (geocentric vs. heliocentric); 2. Religion claiming that the development of life and living beings occurred by God's direct and specific creation of each species, whereas the natural sciences determine that it happened through evolutionary processes; [in both these cases, there was a lack of awareness of the proper limits of each way of knowing]; 3. The current affirmation by many representing science that, since God is not needed at the level of scientific explanation, God is not needed at all; 4. The current tendency of some scientists to extend or generalize a legitimate conclusion of the sciences to situations far beyond what scientific justification warrants – e.g. in some applications of the sociobiology of insects and animals to human beings, without further careful investigation.

5. What has been the role of religion in the development of science in the West?

Though I am not either an historian, or an historian of science, I believe that it has been fairly well argued that the Judeo-Christian theological tradition strongly encouraged the investigation of nature through the interplay of observation/experiment and theory: 1. By emphasizing that human beings have a duty and a right to care for and to use nature; 2. By desacralizing or demythologizing nature and natural processes – so that, though they are seen as gifts of God, they are not seen as divine in themselves; they are for human beings, and for God's glory; 3. By declaring that all things are essentially good, and well-ordered, since they are God's creation – therefore to find out more about them is good, and possible, since their inter-relationships are regular and rational.

6. Can we have a religious science?

Strictly speaking we cannot have a religious science, since science itself, by its very nature, prescinds from perceived divine revelation. There is no place for special divine revelation – that is, divine revelation beyond God's revelation of God's self in the laws and processes of nature – in the methods of science. It cannot count as scientifically acceptable evidence.

7. Can science dispense with religion?

This question is ambiguous. In light of the above, science can dispense with religion – in the sense that, in order to do good science, we do not need religion, theology, or religious faith. In fact, if we relied on religion to do science, we would certainly do very bad science. However, this does not mean that the values, attitudes and convictions fostered by religion are without significance for science. Apropos of what we briefly stated in Question 5, it is possible that the social and cultural climate generated or reinforced by a given religion would either strongly encourage or strongly discourage, or even outlaw, scientific investigation. This has happened in the past, and it happens in some contexts now. Finally, referring to a rather different meaning this question might have, science can not legitimately do away with religion, or render it superfluous. This is simply because science is not competent to adjudicate questions relating to the authenticity of divine revelation, of belief, of human values, or of the ontological status of their objects. Faith and religion will always be an important part of any culture, and an important and essential component of individual and communal human experience. Science and technology will also be components of cultures, to a greater or less extent. Within a cultural context, there is no essential conflict between the scientific and the religious realms – though tension and conflict may certainly occur and dominate in a given situation, for the reasons we mentioned above.

8. Can one separate the domains of activity of science and religion completely?

This cannot be done. First, science and religion will share the same cultural field, and so they will always interact in different, often automatic and unreflective, ways within that field – through education, mass media, technology, pervasive symbols and images and values, intersecting communities of interest. Secondly, at the personal level, almost all persons within a culture will be affected by both religion and science – one way or another. Each individual will either integrate, or fail to integrate, these perspectives. Some will have strong commitments to both at the same time, which is now the case in all Western countries.

Prof. Charles H. Townes

Date of Birth: July 28, 1915 (Greenville, South Carolina, USA)

Education: B.S. in Physics and B.A. in modern Languages (1935), Furman University; M.A. in Physics (1937), Duke University; Ph.D. in Physics (1939), California Institute of Technology.

Post-Doctoral Professional Experience: Associate Prof. of Physics (1948) and Prof. of Physics (1950), Columbia University; Vice-president and Director of Research (1959-61), Institute for Defense Analysis, Washington, D.C.; Institute Professor at MIT (1966); University Professor (1967) and University Prof. of Physics, Emeritus (1986), University of California at Berkeley.

Awards: Shared the 1964 Nobel Prize in Physics with A. Prokhorov and N. Basov for his fundamental work in Quantum Electronics; David Sarnoff Electronics Award (1961); the 1961 Rumford Medal (the American Academy of Arts and Sciences); the 1962 John Carty Award (National Academy of Sciences); the Niels Bohr International Medal (1979); the 1982 National Medal of Science;The Founders Award of the National Academy of Engineering (2000); The Lomonosov Gold Medal of the Russian Academy of Sciences(2001).

1. What is your definition of science and of religion?

Science is an attempt to understand the structure of the universe and how it works. This includes all aspects, from the origins of our universe to the consciousness of humans. Religion is an attempt to understand the purpose and meaning of the universe, including its origins, the reasons for it characteristics, and of course the purpose and meaning of human life.

2. Do you see any conflict between your definitions of these two concepts?

I see no necessary conflict between science and religion. Clearly, they are closely related and must, if we understand them well, converge and fit together well.

3. Where do you think there may be a conflict between these two?

I believe what conflicts appear between science and religion result from human misunderstandings of one or both of these and narrow-minded interpretations of what we think we know.

4. What have been the grounds for the development of conflict between these two?

Rigid and dogmatic principles and beliefs are common in humans. And when we don't understand completely, there are inevitable apparent inconsistencies in our thoughts and knowledge. This persuades some people to choose one side of an apparent inconsistency and discard the other rather than being open-minded to both, hoping for better understanding eventually. There are inconsistencies within science itself which scientists generally accept, recognizing that our knowledge is incomplete. But some scientists and some religious persons do not accept that their knowledge is imperfect, and believe one point of view is so precisely correct that an alternative one cannot be considered.

5. What has been the role of religion in the development of science in the West?

I believe monotheistic religion has had an important influence on the development of science. Belief in a single and reliable God, for example, leads naturally into a view of consistent behavior by the universe around us. A belief in consistency and reliability in the laws of science is basic to its development.

6. Can we have a religious science?

Yes, we can have a religious science in the sense with which I interpret what that means. Science and religion must converge and be consistent if we understand them well enough and, in that case, it may become difficult to distinguish sharply between them.

7. Can science dispense with religion?

Science can progress in an atheistic environment. Conceivably, enough progress in understanding science and religion may lead some to believe that religion as they define it has been displaced. But it is much more likely that religion will be strengthened, though changed somewhat, as our understanding develops further.

8. Can one separate the domains of activity of science and religion completely?

I do not believe the domains of science and religion can be separated. If religion or spirituality has any impact on this universe or on humans, then these impacts can be studied by logic, accumulation of evidence, and intuition, and such studies are essentially science. Any understanding of science or of religion by humans must use whatever human resources we have, and in this use they cannot be separated completely.

Prof. Roger Trigg

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Education: New College, Oxford. 1960-66: M.A. in Classics and Philosophy, D.Phil. in Philosophy.

Post-doctoral Professional Experience: Lecturer, Senior Lecturer and then Reader in Philosophy (1966-87); Professor of Philosophy, University of Warwick (1987-2007); Emeritus Professor of Philosophy, University of Warwick, 2007-, Director, and then Senior Research Fellow, Ian Ramsey Centre, University of Oxford, 2006-. President of the European Society for Philosophy of Religion, 2008-10.

Recent Publications: *Religion in Public Life, Oxford University Press, 2007; Equality, Freedom and Religion, Oxford University Press, 2012; Religious Diversity, Cambridge University Press, 2014; Beyond Matter: Why Science Needs Metaphysics, Templeton Press, 2015; Does Science Undermine Faith? S.P.C.K. Press, London, 2018 Monotheism and Religious Diversity, Cambridge University Press (Elements Series) 2020. Also Roger Trigg and Justin L. Barrett, (eds.) The Roots of Religion: Explaining the Cognitive Science of Religion, Routledge, 2018*

1. What is your definition of science and of religion?

Science is an empirical discipline. A narrow empiricism has been seen to be inadequate as a philosophy of science, since it cannot properly account for the status of theoretical entities. The role of theory is now properly acknowledged. Nevertheless, theories are constrained and guided by empirical findings, even if theories cannot be strictly deduced from them. As a result, observation and experiment play a large role, and when scientific theory goes too far from the restraining influence of empirical data (as when physics posits many universes), it empties science of real content and becomes empty speculation.

Religion, on the other hand, should certainly be related to human experience, but it deals with the existence of the transcendental realm, which by definition lies beyond human observation, and is distinct from the physical world. As a result, a main feature of any religion should be to show how, despite the transcendence of God, something of the divine nature has been revealed to humans within the confines of this life. Religion is not mere philosophy. It points to particular revelations as ways in which God has bridged the gap between infinity and our finite existence. God, religion will say, has come to meet us.

2. Do you see any conflict between your definitions of these two concepts?

Implicit in these definitions is a dualist conception of God and the physical world, existing at different levels of reality. The physical and the metaphysically transcendent must remain separate. Nevertheless, this does not mean that they are unrelated, since if God is Creator, the nature of the physical world ultimately depends on God's will. This is God's world. It is important that God is not identified too closely with its processes, in a pantheist manner. This would not make God distinct enough from the undoubted evil which is around us. On the other hand, God must not be thought so separate from the physical world that he is unconcerned with it and is uninvolved with it. God is transcendent but also immanent. He is separate but also at work in the world. There is a tension in this view, which underlies all religion. God created our world, but not everything in it is in accordance with His will. In Christian theology, the distinction between God as Creator and God as Holy Spirit tries to do justice to the fact that God is apart from us and yet also within us. God cannot be the God of the deists who saw Him merely as a divine watchmaker who set the mechanism in motion and then left it alone.

3. Where do you think there may be a conflict between these two?

One clear conflict stems from the fact of the success of science and the unwillingness of many to envisage the reality of anything that cannot be explained as scientifically. Naturalism is the modern version of an ancient materialism which saw everything as constituted by matter. Nowadays, matter seems dissolved into energy, but many believe that the only reality is that which can be accessed by the natural sciences. It is assumed that science can explain everything and has no need of a metaphysical framework. Every part of science which seems to further the materialist programme is a potential source of conflict with religion. When neurophysiologists try to reduce the human mind wholly to neural processes, or when biologists try to explain the contents of cultures solely in terms of genes, there is an implicit (and sometimes explicit) attack on a religious view of the world. Religion must see reality as being more than a succession of physical processes, and cannot allow human reason to be reduced to a succession of physical states.

4. What have been the grounds for the development of conflict between these two?

A belief in a God of the gaps as an explanation for anything of which we are presently ignorant, can be very dangerous. As science advances in its explanation of many physical processes, it can seem as if its progress is remorseless and that nothing will be left unexplained. Indeed it is part of the methodology of science to keep looking for physical explanations. Just as the excuse that "the fairies did it" would not be accepted, so the claim that "God is at work" would not be regarded as a reason for not searching more deeply for scientific understanding. The problem is that just because science can explain many things does not mean that it can explain the conditions of its own success. There is also the point that just as we should not appeal to God merely because of our ignorance, it does not follow that physical explanations must always be forthcoming or be adequate. Not everything is reducible to physics, nor is it even within the reach of science. What science does not look for it will not find, but when it does not find an explanation, this may be because of the limits of science itself.

5. What has been the role of religion in the development of science in the West?

Religion has historically been the motor behind the quest for scientific understanding. It is a historical fact that at the dawn of modern science in the seventeenth century, scientists such as Newton and Boyle in Cambridge saw themselves as uncovering the laws of nature given by God as lawgiver. They were working in a philosophical and theological environment in which they saw the exercise of human reason as the exercise of a God-given faculty. It was, in a phrase beloved of the Cambridge Platonists, "the candle of the Lord". It gave us a partial understanding, like the flickering light of the candle, but it was an understanding, derived from God, of a world which is infused with the rationality given it by God. The Cambridge Platonists helped shape the world of Newton and Boyle, and were among the founders of the Royal Society in England under Charles II. They can have a claim to be at the beginnings of the European Enlightenment but their view of reason was far removed from later secular and anti-religious views of rationality that swept countries like France in the eighteenth century. For them, reason was God-given and was concerned with God's world. They helped create modern science, and are witnesses to the fact that science not only was born out of theology but still needs a theological underpinning.

6. Can we have a religious science?

The everyday practice of science is independent of the metaphysical assumptions which should support it. There is no contradiction in an atheist being a scientist. Nevertheless, the question remains, what has to be presupposed for science to be practised in the first place. A belief in the order and the regularity of the world is clearly essential, as is an assumption that our minds are attuned to understanding its processes. Why, for instance, should mathematics, apparently the product of human minds, be so well able to uncover the secrets of the physical universe? Not only is the world intelligible in that it is ordered, but it is intelligible to us. Why is the human mind able to be attuned to it? Religion can answer this question. Human rationality reflects the rationality of the Creator.

7. Can science dispense with religion?

Clearly many scientists think that they can. They prefer to take the world, its structure, and its regularity, for granted it. In the end, however, we have to be forced back to philosophical questions underlying science. Why is there something rather nothing? Why is the world structured? Why is it intelligible? Science cannot give answers to these questions within its own terms. It can shrug them off, but the fact that it cannot answer them ought to be significant. Appeals to evolutionary processes merely in their turn raise the questions as to why the world is ordered in such a way as to evolve, and how the human mind can grasp theories of evolution in the first place. Science needs a metaphysics with which to operate. It can assume the metaphysics of earlier generations whilst at the same time pretending to repudiate it. What it cannot do is to think that the practice of science can be justified within its own terms.

8. Can one separate the domains of activity of science and religion completely?

Many try to do so, perhaps in the mistaken idea that they protect religion from being challenged by science. Yet both must concern the nature of a reality independent of human beings. In philosophical terms, they must each espouse a metaphysical realism. Yet a schizophrenic approach to reality dividing it up into compartments is stultifying. Metaphysical and physical reality must be related. Any attempt to fence religion and science off from each other ends up with science claiming the whole of reality and religion left within the domain of something else, such as morality or aesthetics, which then appears wholly subjective.

Religion must hold the key for understanding why human reason –derived from God – can grasp the nature of a world created by Him.

Prof. Keith Ward

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Recent Books in Science and Religion Books: *In Defense of the Soul* (Oneworld publications,1998) ; *God, Chance, Necessity* (Oxford: Oneworld Publications, 1996) ; *In Defense of the Soul* (Oneworld Publications ,1998) ; *God, Faith and the New Millennium* (Oneworld publications, 1998); *The Case for Religion* (Oneworld publications ,2004) ; *God: a Guide for the Perplexed* (Oneworld publications, 2002) ; *Is Religion Dangerous?* (Lion Hudson, 2006) ; *God and the New Atheism: A Critical Response to Dawkins, Harris, and Hitchens* (Westminster John Knox Press, 2007) ; *The Big Questions in Science and Religion* (Templeton Foundation Press, 2008) ; *Why There Almost Certainly Is a God: Doubting Dawkins* (Lion Hudson, 2008) ; *Religion and Human Fulfillment* (SCM Press, 2008) ; *The God Conclusion : God and the Western Philosophical Tradition* (Darton, Longman & Todd Ltd ,2009) ; *More than Matter :Is Matter All We Really Are?* (Lion Hudson ,2010) ; *Is Religion Irrational?* (Kindle Edition, 2011).

1. What is your definition of science and of religion?

I think of science as the close observation of physical phenomena, aiming to explain their behaviour in terms of regular laws, preferably mathematically expressible and testable by experiment and confirmation by other competent scientists.

Religion, in a broad sense, is a set of practices aiming at human fulfilment by conscious relation to a spiritual reality of great value, which is often thought of as the causal basis of the physical world.

2. Do you see any conflict between your definitions of these two concepts?

There is no direct conflict between these definitions, since one deals with physical and the other with spiritual realities. But of course if the physical world is the effect of a spiritual reality (for instance, God), then the physical world must be consistent with the relevant idea of God. So the possibility of specific conflicts between the two sets of ideas is always present.

3. Where do you think there may be a conflict between these two?

Conflicts have mainly arisen historically between literal interpretations of ancient Scriptures and observations. So the view that the earth goes around the sun, or that humans evolved from one common non-human organism, or that all human actions are completely explicable physiologically (in terms of brain-states) all conflict with some interpretations of Scripture.

4. What have been the grounds for the development of conflict between these two?

The main ground is literalist interpretations of Scripture, or adherence to outmoded forms of early philosophical thought (for instance, the philosophy of Aristotle). But on the scientific side, there has also been a tendency to a purely materialist interpretation of nature, and a resistance to any sort of 'supernatural' or spiritual causality.

5. What has been the role of religion in the development of science in the West?

Religion has played a very important role in the development of science, historically. Early Muslim thought enjoined the study of the natural world as a way of understanding God's creation. In Judaism and Christianity, similarly, the idea of one wise creator God inspired the search for rational principles or laws underlying observed reality. Many great scientists (e.g.Isaac Newton)were deeply religious, and motivated by the desire to understand the divine wisdom evident in creation. But they were also usually free-thinkers (not orthodox). Perhaps science needs a quasi-religious inspiration to seek an intelligible and beautiful truth in the universe; but it also needs freedom of enquiry to try out new and unusual ideas.

6. Can we have a religious science?

I am not sure what a 'religious science' would be. To me, that is rather like asking whether we can have a religious motor mechanics. I think science rarely deals directly with spiritual matters, and can have its own autonomous life. But scientists can certainly be, and often have been, religious. I do not think, however, that a religious science would be any different from a good non-religious science.

7. Can science dispense with religion?

At first sight, yes. But maybe, at a deeper level, the concern to find truth, and the belief that nature follows rational laws and is intelligible, depend upon a sort of religious belief in the rationality of a creative intelligence. Science can, however, dispense with particular sets of religious beliefs, derived from revelation, since they rarely provide information about the physical world. If they did, there would have been no need for empirical science to develop.

8. Can one separate these two domains completely?

Yes, I think one can, at the level of actual physical investigation and theory-formation. However, if this is God's world, one would expect and hope for a convergence of scientific and religious insights as human knowledge progresses. It must be said that such a convergence is not yet in sight. Both scientists and religious leaders tend to be unduly dogmatic about the unique superiority of their own beliefs. In my view, that is counter-productive, and both sides require a good deal more humility.

Prof. Fraser Watts

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Post-Doctoral Professional Experience: Dr. Fraser Watts is Visiting Professor of Psychology and Religion at the University of Lincoln, and Executive Secretary of the International Society for Science and Religion. Previously he has been Lecturer in Clinical Psychology, University of London; Principal Psychologist, King's College Hospital London; Senior Scientist, Medical Research Council; Reader in Theology and Science, and Fellow of Queens' College, University of Cambridge.

Publications: His main books are *Psychology for Christian Ministry*, with R. Nye and S. Savage (Routledge, 2002). *Theology and Psychology* (Ashgate, 2002); Forgiveness in Context, ed with E. Gulliford (T & T Clark, 2004); *Spiritual Healing: Scientific and Religious Perspectives* (Cambridge University Press, 2011); *Head and Heart: Perspectives from Religion and Psychology*, ed. with G. Dumbreck (Templeton Press, 2011); *Cognitive Approaches to the Evolution of Religion*, ed. with L. Turner (Oxford University Press, 2014); *Psychology, Religion and Spirituality: Concepts and Applications* (Cambridge University Press, 2017); *Living Deeply: A Psychological and Spiritual Journey* (Lutterworth Press, 2018); *A Plea for Embodied Spirituality: The Role of the Body in Religion* (SCM, in press).

1. What is your definition of science and religion?

There are various factors that make science difficult to define. It can't easily be defined in terms of its methods, because different sciences use somewhat different methodologies. It can't easily be defined in terms of its conclusions, because it is in the nature of science that they are always open to revision. It can't easily be defined in terms of a set of fields of enquiry, as there are controversial borderline cases such as parapsychology. In consequence, science can only be kind in rather general terms, such as careful, systematic empirical enquiry.

Religion is also difficult to define. The various world religions are not all quite the same thing. For example, some are more a matter of cultural identity than others. Some are theistic, but not all. The nature of religion has evolved considerably, and has seen marked historical changes. Religion is, in any case, multifaceted, including at least beliefs, practices and experience. Indeed, it may be one of the distinctive things about religion that it combines these various facets.

2. Do you see any conflict between your definitions of these two concepts?

There is no necessary conflict between science and religion. There only appears to be a conflict when certain scientistic assumptions gather around science, and are mistakenly thought to be fundamental to science. The claim that there is no necessary incompatibility between science and religion is supported by historical considerations, which show that leading scientists such as Isaac Newton operated explicitly within a framework of religious assumptions.

3. Where do you think that there may have been a conflict between the two?

Though there is no necessary conflict between science and religion, there are contexts in which it has been quite widely believed that that is such a conflict. For example, in Christianity in the UK, the idea of conflict arose in the last quarter of the 19th century, in the aftermath of the publication of Darwin's *Origin of Species.* Where a sense of conflict arises, there are usually broader socio-political factors that give rise to it, rather than it being a purely intellectual matter.

4. What have been the grounds for the development of conflict between these two?

The sense of conflict in Britain at the end of the 19th century arose partly from the desire of scientists for science to be independent of religious influence. In contrast, in the 17th century, science had been religiously motivated and, to use the title of John Ray's important book, been regarded as the study of *The Wisdom of God Manifest in the Works of Creation.* In the late 19th century the term 'science' had been freshly coined, scientific institutions were being developed, and science wanted to break free of the religious context in which it had initially developed.

There was also a growing sense of separation between public and private domains, with science on the public side and religion increasingly seen as a matter of the private devotion. One aspect of this growing divide was a separation between two ways of using language, one literal, describing what was true, and the other more symbolic and expressive of personal convictions. Science was seen as using language in the first way, whereas religion was increasingly seen as using it in the second way.

There are probably somewhat similar socio-political reasons for the sense of conflict between science and religion in the contemporary Muslim world. There are secularists who might similarly want to use science to break free from religious influence.

However, though the sense of conflict between science and religion has often led to an advocacy of science and a rejection of religion, things can sometimes move in the opposite direction. For some Muslims, Islam is an important part of cultural identity, whereas science can appear to be something imported from an alien, secularist and American-dominated world. That can lead to Islam being endorsed and Western science being rejected.

5. What has been the role of religion in the development of science in the West?

Religion played an important role in the development of science in the West, showing that it is possible for religion to play such a role. Religion makes assumptions about the lawfulness of the world, which is seen as part of God's creation. It was the theological assumption of lawfulness and orderliness that made empirical scientific enquiry worth undertaking.

Further, in the 17th century, the age of the scientific revolution, when science was still a novel activity and might have been regarded with suspicion, religion provided a rationale for scientific enquiry, and so gave it respectability within society. Nature was widely seen as one of the 'Books on God', so science was seen as a way of reading nature as a Book of God.

The secularist assumptions of contemporary science are culturally contingent, and the theistic assumptions widely adopted by science in the early modern period shows that it can be otherwise. Though religion provided a favourable climate for the development of science, it probably had little influence on specific scientific theories and hypotheses, nor did it have much influence the content of science.

6. Can we have a religious science?

Science frequently has to make choices between different theoretical approaches to the particular phenomena under investigation. Which choices are made is influenced by broad metaphysical considerations. It is possible, in principle, to have a religious science in the sense of a science that is influenced by theistic assumptions in its development of theory.

For example, it has been argued that theistic assumptions might guide science to investigating the lawfulness of the quantum world, rather than regarding it is indeterminate. It is also been suggested that theistic assumptions would be more favourable to seeing cooperation as a fundamental principle in evolution. I would like to see religious metaphysics have more influence on scientific theorising.

7. Can science dispense with religion?

Science does not need to take any explicit interest in religion, and normally does not do so. Modern science generally makes secularist assumptions, even if individual scientists are religious in their private lives. Officially and publicly, science can dispense with religion.

However, science cannot avoid making broad metaphysical assumptions. The last 50 years have seen a growing philosophical interest in the implicit metaphysics behind scientific theories. Science always makes metaphysical assumptions, and probably cannot avoid doing so. Religion also makes metaphysical assumptions, and metaphysics provides a meeting point for science and religion. Science can dispense with religion, but it cannot dispense with metaphysics.

8.Can one separate the domains of activity of science and religion completely?

Scientific activity can be separated from religious activity. Laboratory research can be separated from spiritual practices such as prayer. However, there are broader considerations about the significance of scientific and religious activity that bring them into contact. They are both concerned with truth, and neither can eventually avoid the truth claims of the other.

Sciences is often concerned with highly specific questions, and indeed needs to investigate matters that are currently tractable, given the current state of scientific knowledge. However, the scientific enterprise ultimately aspires to comprehensiveness. That means it cannot ultimately ignore religion, as is seen in the scientistic critique of religion developed by the New Atheists.

There is no domain that cannot be investigated scientifically, even if science cannot always give a complete account. For example, there is a scientific study of religion, which is currently making good progress, even though science cannot give a complete and exhaustive account of all religious matters in its own terms.

It is characteristic of the religious mode of understanding to want to place things in a broad context. The theistic belief that everything is part of God's creation and is enfolded within the life of God, leads it to want to place scientific knowledge within that broader context. The contextualisation of scientific knowledge within broad religious assumptions is a core theological activity.

If science and religion are properly understood, they do not offer conflicting answers to the same questions. They have different modes of understanding and explanation which do not directly conflict. Even when they take an interest in the same domain they are normally trying to answer different questions about it, such as science asking 'how' questions and religion asking 'why' questions.

Science and religion cannot ultimately be separated though, for many practical purposes, they can proceed independently. Though they cannot be separated, neither do they conflict, as they approach things from distinct but complementary perspectives.

Prof. Dr. J.F.G.M. Wintermans

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Post-Doctoral Professional Experience: Post. doc. fellowship, Pennsylvania State University (1958); Lecturer of Botany (1970); Professor of Botany (1980); Professor emeritus (since 1986), Catholic University at Nijmegen.

1. What is your definition of science and of religion?

a) Science is the mental activity by which man relates to, explains and connects the varied external and internal phenomena which occur to him. The term means both the searching for their truth, and the resulting insights or knowledge.

b) Modern science is characterized by several methodological restrictions:

1. It is mainly directed at efficient causal relations and specifically rejects final causes as scientifically valid explanations.

2. It is anthropocentric and utilitarian: "To know something is to imagine what we can do with it when we have it" (Francis Bacon). By knowledge, we become "masters and owners of the world" (Descartes).

3. Its searches and explanations start at the lowest and simplest level and go to more complex or higher levels by "bottom-up" methods. This implies a tendency to reduce the complex to the simple, and the inherent danger to lose contact with the aspects which were left aside in the earlier steps of the investigation. So, e.g., life is reduced to anatomy and physiology, mind to neural processes, God to mental images. Purpose and meaning then are just interpretations by an accidental, contingent life from: man.

Religion: This word is derived from the Latin verb *ligare*, which means to bind. It means the intimate binding, connection of man with the world as a whole. More specifically it means the relation of man with God as the Creator of the world. In religion, world and life are seen primarily as a gift, "grace", "coming from above". In such a "top-down" view, God is ultimately seen not as an unconscious process, but as a Person, Who has purposes with His creation and with man. In religion, therefore, man is meant by God, he is not just an evolutionary accident.

2. Do you see any conflict between your definitions of these two concepts?

Science as defined under (a) should be quite compatible with religion, especially in its general meaning. Modern science as defined under (b1) has, historically and empirically, a conflicting relation to religion, especially with theistic religions.

3. Where do you think there may be a conflict between these two?

Where religion claims to have such a full understanding of God's purposes and creative acts, that the bottom-up approaches of science are invalid or unnecessary. (e.g. Galileo case).

Where science forgets that its methodological restrictions limit the domain of its statements, or: where it takes necessary conditions for sufficient conditions. (e.g. Dawkin's statement: "human life... is no longer a mystery... it was solved by Darwin and Wallace").

4. What have been the grounds for the development of conflict between these two?

The historical grounds must probably be sought in developments in medieval culture – both in the Christian and the Islamic world – with respect to the relations between theology and philosophy, including natural philosophy. Problems arose on the relation between theology and philosophy, including natural philosophy. Problems arose on the relation between God's omnipotence and the possibility of natural laws, which could be understood by human intellect. How could God's sovereign freedom be maintained if He was bound by laws, and how could natural intelligence understand God's purposes, if natural laws were God's freely chosen decrees? In the West, these problems were somehow solved by the separation of Aristotelian final causes –understood as intentions, purposes – which stayed within God's domain, from efficient causes which could be the domain of man's knowledge. The essential steps to "the mechanization of the world image" date from the late middle ages, as was argued by Dijksterhuis. Descartes completed the separation of matter and spirit. The complete separation of science from theology, or from revealed religion, in 18th century Enlightenment logically followed from these developments.

5. What has been the role of religion in the development of science in the West?

Long before the problems outlined under (4) became acute, the relation of religion and natural knowledge was not seen as a problem. Psalm 8 says: "The heavens tell the Glory of God, the firmament announces the work of His hands". Psalm 115: "The heaven of heaven is God's, the earth He gave to the sons of men". There was no principal objection to study of nature. In the West, however, the ravages resulting from the collapse of the Roman empire were much worse than in the East. Rebuilding literacy and education, science became the task of the Church. In fact, literacy was mostly restricted to monks and clergy in the early middle ages. (Up to now, it is usual to have administrative tasks executed by "clerks"). Scholasticism started with learning what was salvaged from antiquity, copying available manuscripts, then commenting texts, finally original investigation. Of course, most attention went to Scripture and theology, but soon philosophy and some natural philosophy followed and scholastic curricula were established. From the 11th century on, some clerics became intellectuals who insisted on their intellectual independence (le Goff). Church schools developed into universities, the first of them chartered by Popes. The division of tasks between theology and science, natural philosophy outlined under (4) was not meant as a divorce: natural theology studied the wisdom of God as revealed in nature, whereas theology studied the revelation of God given in Scripture. These two revelations could not be contradictory. Natural theology became more important in modern times, as being not involved in the theological and political controversies which ravaged Western Europe in the 16th and 17th centuries. Its importance decreased after 18th century enlightenment, which divorced science from theology completely. See also question (4).

6. Can we have a religious science?

Where as a considerable number of scientists believe in God, science as based on the restrictive premises outlined under (b1) is a fundamentally secular enterprise. Its impressive success cannot conceal its fundamental weakness: the "dignity of human nature" and its transcendent and moral value cannot be validated and maintained if only "scientific" evidence is the criterion of truth. But within the scientific enterprise, religion cannot correct this deficiency. It must minimally be seen as complementary to science. By this, I mean that science and religion are not mutually excluding alternatives but that they approach truth from different angles (see e.g. Katasonov's remarks to question 6). Theology, the religious approach of truth can be called science if science is not defined in the restrictive way. For example, Edith Stein (a German nun, victim of the holocaust published her commentary on the mystic writings of Juan de la Cruz under the title: "Science of the Cross". In my view, it is legitimately so, but many will consider it improper or provocative.

7. Can science dispense with religion?

A preliminary condition for any science is the moral integrity of the scientist. This cannot be validated within the scientific activity, as argued above (question 6). Even the philosophical science of ethics presupposes the validity of its own rules, hence it is not falsifiable in the same way as theories or paradigms of natural science are. Morality requires a personal sense of obligation. The root "liga" is etymologically the same as we find in "religion" (see question (1)). Hence, science can never be an entirely "value-free" activity. Its conclusions do not impose themselves on the scientist without a free act of the mind: assent, which is given to a range of reasons considered sufficient for a proof. Given assent constitutes a belief. Religion is assent to the revelation of God, Who cannot deceive. Belief in scientific evidence is theoretically not a full assent, since the data are always falsifiable (Popper), but often a genuine belief. A genuine belief can live with arising objections, unexplainable mysteries, it is a faith. Faith has two meanings: (1) acceptance of a set of propositions (intellectually) and (2) fidelity, loyalty (morally). A secular scientific theory can thus develop into a secular belief. In the 19th century, Auguste Comte dreamt of a "religion of humanity" based on "positive science". Modern evolution theory also displays so many ideological extensions that the ethical philosopher Mary Midgley wrote a book *Evolution as a Religion*. (This, of course, required a rather broad definition of the term religion).

Conclusion: Science can only dispense with religion by becoming a substitute religion.

8. Can one separate the domains of activity of science and religion completely?

I agree with Andrei Grib's response to this question: "One cannot separate the domains of activity of science and religion, because the frontier between transcendental and immanent can't be defined by a human being and one must expect intersections between them, fruitful for the development of both".

Dr. Mark Wm. Worthing

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Postgraduate Experience: Lecturer in Theology and Ethics, Luther Seminary, Adelaide (1995-present).

Publications: *God, Creation, and Contemporary Physics*, (Fortress Press, 1996; Templeton book prize, 1997); *Theology as Universal Science* (Peter Lang, 1996).

1. What is your definition of science and religion?

I understand science as the human endeavour to obtain knowledge. While "science" in the English language is often restricted to the so-called natural sciences, I would include the human sciences (*Geistesissenschaften*) as well under this term. Whether we are seeking to better understand an historical event, human behaviour, or the formation of stars, the knowledge sought and the methods employed in the search are of a kind. All such activity, I would broadly call science. Religion, on the other hand, is often portrayed as the antithesis to science. Some would say that in the case of religion, it is not knowledge (*scientia*) but wisdom (*sapientia*) that is sought. And it is not formal methods that leads to results but rather faith. Yet, the contrast can be overdone. If religious realities are just that, namely real, then they cannot be epistemologically unrelated to physical and historical realities. The search for religious truth cannot be disconnected from the search for other truths. The practice of religion, or our human action based upon what we believe to be religious truths, follows an often very different path to that of science, but the two realms cannot be absolutely separated.

2. Do you see any conflict between your definitions of these two concepts?

No.

3. Where do you think there may be a conflict between these two?

If the question has to do with areas of historical conflict, these are well-documented. In the West, any question having to do with origins, either human or cosmic, has been prone to conflict. This probably has much to do with the fact that theism was often defended as being necessary to explain why there is something rather than nothing, and why there is life rather than non-life. Scientific claims to be able to answer these questions have often been interpreted by religious thinkers as a direct assault on theistic claims.

4. What have been the grounds for the development of conflict between these two?

Historically, conflict between science and religion has arisen whenever either has made comprehensive and exclusive truth claims that extend beyond their respective areas of competence. When religious thinkers feel compelled to declare the limits of natural science or to approve or disapprove scientific theories, problems are inevitable. Likewise, when scientists feel compelled to pass judgment on the value and veracity of religious propositions and religious experience conflict is unavoidable. In the West, we have moved from the era of the Baconian compromise in which science and religion were held to work in completely unrelated spheres to an era in which increasing numbers of scientists and religious thinkers believe there is at least some significant area of overlap between the two. This shift, however, has caused uncertainty as to the precise boundaries of each field. This uncertainty, in turn, has tended to lead inevitably to territorial disputes and a sense of the "other" discipline as a threat. I think this situation, to some extent, will continue until both scientists and theologians can agree broadly on functional models of complementarity that respect the independence of each field while at the same time recongnizing their legitimate mutual interest in a growing number of questions.

5. What has been the role of religion in the development of science in the West?

For many, it is one of the great ironics of the history of Western intellectual development that the medieval university system, which included departments of natural philosophy (science), grew out of cathedral and monastery schools of theology. In fact, in the West, it was the Judeo-Christian insistence upon monotheism that led directly to the desacralization of the world. No longer did people look to the spirits or gods of individual animals, plants or seasons for explanations as to why things happened. For this reason, early Christians in the Roman world were accused of being atheists because they were in fact denying the reality of all these various deities and spirits. This new worldview freed people to seek answers to their questions of causality in purely natural sources. For instance, crops did not grow or fail to grow at the whim of the gods but due to the correct quantity of rainfall, nutrients in the soil, sufficient sunshine, etc. In turn, the amount of rain and number of sunny days were caused by weather patterns that could often be predicted by the observation of natural processes and cycles. Yet, as obvious as this all seems, there was a time in which most people would not have bothered to ask such questions, since it was obvious that the success of a season's crops depended upon pleasing the right deities in the right manner. This desacralization of the world brought about in the West by the dominance of Judeo-Christian thought made the whole concept of scientific investigation possible in ways never before imagined.

Yet, ironically in more recent times, as science became more successful at answering the questions people asked and giving practical solutions to a number of concrete problems, it came to be seen as competition with the very Judeo-Christian thought that played such a significant role in its rise; or more often, by religion's presumed opposition to science. The radical materialism and tendency to reduce all things to combinations of physical laws and material realities in modern science owes much to this dynamic.

While I would not want to contend that science would not have arisen in the West apart from religious influence and without the context of a theistic religious worldview, at the same time, the nature and shape of scientific development in the West cannot be understood properly apart from this religious context.

6. Can we have a religious science?

Simply put, the answer has to be 'no'. We can have science that respects religion. We can have scientists with genuine religious commitment. We can even have a scientific study of religion. But a religious science is surely a contradiction. However much awe and respect we have for our subject matter, religious beliefs should play no formal role in scientific methodology. Any scientific study should produce the same results regardless of the religious commitments of the investigators. This is, of course not to suggest, that science should take no notice of religious insight. Nor should science believe that it alone can give complete answers to questions to the big questions of meaning and purpose in the universe. We can have a science open to religion and religious insights, but not a religious science as such.

7. Can science dispense with religion?

No. But unfortunately there have been times when it seemed that some within the scientific community had this very aim – and not a few in religious communities feared that this might just be possible. If religion was merely an invention of human convenience, then human scientific endeavour could, in theory at least, replace religion with answers about the world around us based upon scientific investigation. The stubborn fact, however, is that the religious impulse is an integral part of our humanity. Science can no more dispense with the human religious spirit that it can change human nature. But this is not the purpose of science. Science investigates what can be known of the physical world and of the life it contains. In doing this, it may well dispel some ideas that were held to be religious explanations of reality. This is especially likely in those cases where religion has overstepped its own bounds and attempted to give a religious explanation of a physical reality. Yet, there is a great difference from being capable of dispelling the occasional religious claim about the nature and workings of the material world and dispensing with religion itself.

8. Can one separate the domains of activity of science and religion completely?

The critical word here is "completely". The failure to distinguish between science and religion and their respective domains has led to much confusion in the past. Yet, just as problematic, has been the insistence upon complete separation of the spheres of science and religion. The proper distinction between science and religion is a necessity in the modern intellectual environment. Each must recognize its own proper areas of competency as well as its own epistemological limits and limitations. Yet, for theistic confessions of faith in a God who created the physical universe, any complete or absolute separation of science from religion would amount to a tacit denial of the most basic claims of theism.

AFTERWORD

When I sent my questionnaire to the scholars who have contributed to this volume, I could not believe that there is so much similarity between the views of the scholars involved. Of course, at the science-religion and science-theology conferences that I had attended during 1990's, I had noticed a lot of common views between the scientists committed to monotheistic religions, but the responses reflected in this volume went much beyond my expectations.

Here, I shall give a brief analysis of the answers given to my questions, mentioning the extent of agreements and disagreements.

1. Definition of Science and Religion

In the questionnaire, by science I meant the sciences of nature, and here the definitions given by respondents could be summarized in the following form: "*Science is the systematic search for understanding of the way natural world is structured and functions*" (G. Ellis).

Byl believes that science involves much more than empirical observation and mathematical analysis. He refers to the observational aspects of science as science 1 and to the theoretical extrapolation and explanation of these observations as science 2.

According to Haught, science seeks quantitative knowledge of recurrent natural routines on the basis of which makes practical prediction. In doing so, it deliberately leaves out any adequate consideration of value, purpose, God, meaning, novelty and subjectivity.

In the case of religion, the definitions given by the respondents were apparently different. But, all of their definitions of religion fell within one of the following categories.

■ Religion is a respond to the transcendent by which meaning [that underlies the physical world] is provided and human lives are transformed (Clayton, Fulljames).

■ Religion is the right pattern of knowing and worshipping God (Bell).

■ Religion is a way of life and a philosophy of life based on humanity of man and for guiding him to the belief that the universe has a Creator and Sustainer (Butt).

■ Religion seeks to understand and to bind us to the scheme of things in which God is preeminent (H. Smith and Wintermans).

■ Religion has to do with the ultimate good of man and is concerned foremost with the relation of man and God. It is based on a divine revelation (W. Smith).

■ Religion is a consciousness of supra-natural which shape man's view of himself, his position in the universe and his relation with things therein (Zaki Kirmani).

■ Religion is a system of doctrinal beliefs about Divine reality and God's creation and a system of rituals and practices, both individual and collective, which aim at the fulfillment of one's relation with God and fellow humans (Bakar).

■ Science operates with the presumption that there are causes to things, religion with the presumption that there are meanings to things (Rolston).

■ Religion results from the encounter with God in which God opens one's eyes for an evaluation of all personal life experience from God's perspective (Schütz).

■ In the broadest sense religion is devotion to whatever one takes to be of ultimate importance. Less broadly speaking, religion is the cultivation of a sense of mystery that transcends the knowable world. Religion in a third sense typically means belief in a personal God (Haught).

■ A set of beliefs, values and practices that form a worldview may be termed religion 1 and a worldview that affirms the existence of a supernatural may be termed religion 2 (Byl).

■ Religion looks beyond the natural processes themselves to discern the ultimate meaning, purpose and significance in them (Hurlbut).

■ Religion embraces all aspects of our relationship with the Divine. This relationship is a personal one and involves living one's life as we believe God intended us to do (Stannard).

■ Religion is a Divine message that has been granted to help man to know God and to prepare him to face God (Guiderdoni).

- Religion is the Divine Guidance and as such bestows upon us two fundamental states of mind: one is the consciousness of the Divine Presence in all; the other is the moral sensitivity in our behaviors (Acikgenc).
- Religion, in its broadest sense, is that fundamental truths which resides at the core of one's existence and defines one's worldview (Iqbal).
- Religion can ask ultimate questions and receive answers about significance and value (Albright).
- Religion is basically about relationships: to God, other human beings, the rest of nature/creation, myself, tradition, history, and future (Jackelén) .
- Religion is a pathway for the life of humans that seeks to achieve the optimal performance and best level of understanding of the purpose for which humans and the world existed (Altaie).
- Religion, in a broad sense, is a set of practices aiming at human fulfilment by conscious relation to a spiritual reality of great value, which is often thought of as the causal basis of the physical world (Ward).

In my view, the first definition includes the other ones. Some scholars preferred to compare theology with science. I see no problem, because theology concerns the theoretical aspect of a religion and can be considered part of it.

Some scholars believed that one cannot give a definition for science or for religion that does justice to it (Brooke).

2. Compatibility of the Definitions of Science and Religion

There is an almost unanimous agreement between the respondents that there is no *genuine* conflict between the two concepts, and that is because of the following reasons:

- They are complementary aspects or layers of the same reality (Ellis and Gregersen) – science provides the mechanism, religion the meaning (Richardson and Hurlbut) ; the two definitions are complementary and are describing two different stages of knowledge, obtained by two different methodologies (Altaie) ; science contributes to obtaining authentic knowledge of the physical world and religion helps us in capturing the inner depth of reality, providing perspective on the purpose and meaning of life (Omar).

- They seek to answer different questions – scientific descriptions answer "how" questions and theological descriptions answer "why" questions (Albright, Bube and Stanmark); these concepts address different kinds of questions concerning reality, generating complementary forms of knowledge (Alexander).
- They are common in their search for pattern recognition (Gregersen).
- Science and religion are closely related and they must, if we understand them well, converge and fit together well (Townes).
- Science and religion express two utterly different spheres of knowledge: science belongs to the human sphere, but religion belongs to the Divine (Acikgenc and Iqbal); one deals with the physical and the other with spiritual realities (Ward).
- Science and religion are both concerned with the search for truth, though they pursue that quest at different levels – science investigating the processes of the world, the other asking the deeper question of the meaning and purpose behind what is going on (Polkinghorne).
- Science and religion appear to be in conflict, because they operate by different methodologies. But, they are no more in conflict that any two activities that take place using different approaches and tools (Hewlett).
- The idea of an interested, active God is difficult for many scientific thinkers to coordinate with their assumption that natural causes are sufficient to account for all events (Haught).
- The conflicts only arise because of erroneous viewpoint on what science and religion exactly are (Guiderdoni).
- Any apparent conflict is an invitation to deepen our understanding of science, or of God, or of both, in order to resolve the supposed incompatibility (Stannard).
- Science may be given the role of the explorer and discoverer and religion plays the role of the wise old philosopher who puts the discoveries into a larger picture and explains " what it means" (Guessoum).

3. The Areas and Causes of Conflict of Science and Religion

The following were mentioned as the main areas or causes of conflict between science and religion.

- Most often conflict occurs where both science and religion have a vested interest, e.g. the origin of the universe (Bakar, Giberson and Worthing) or the origin of humankind (Bakar and Worthing). Conflicts occur when there are 'boundary disputes' between the two domains of knowledge (Alexander).

- Conflict between the two arises where either one has exceeded the proper bounds of its subject (Hodgson, Richardson, Schütz , H. Smith and Guessoum), e.g. if religion interferes with science's attempt to understand the empirical world (Sermonti) or if science claims to yield definitive answers to ultimate questions (H. Smith) or if science makes judgments which are metaphysical in nature or beyond the scope of human reason (Kamal Hassan).
- Conflict occurs if a part of science attempts to further the materialist program, leading to an implicit or explicit attack on a religious view of the world (Trigg).
- There is going to be a conflict if science takes necessary conditions for sufficient conditions (Wintermans).
- Contrary to what is often believed by some scientists, science is based on some metaphysical assumptions (Byl). Thus, there will be a conflict if conflicting meta-physical visions govern science and religion (Gregersen, Hewlett and Kalin). It is often not scientific theories that are controversial but, rather, their philosophical interpretation (Byl).
- Conflict occurs if scientists dismiss religion as nothing but superstition (Albright).
- Confusion of science with technology by some religious leaders causes conflict (Albright).
- The areas of potential, and also actual, conflict between the two lay in their epistemological foundations and their conflicting claims about the natural world (Hazim Shah).
- There is going to be a conflict if science seeks to explain the working of the whole universe without recourse to God (Nasr).
- Conflict occurs if the special nature of human persons is ignored (Del Re and Stenmark).
- Conflict arises if one evaluates religious matters with scientific measures (Davari).
- Conflict often occurs in the extrapolation, explanation and application of observational data and in ontological questions regarding the ultimate nature of reality (Byl).
- Invoking of non-physical reality is not acceptable to those scientist's who are content with the physical aspects of creation (Hewlett).

- The conflict between scientific and religious interpretations arise because the boundary between causality and meaning is semipermeable (Rolston).
- Conflict can arise when sacred texts are interpreted in ways that deal with the latest scientific knowledge (Brooke , Ward).
- Conflict may occur out of the material culture of sciences, leading to a suspicion of references to spiritual values of realities (Brooke).
- Conflicts happen where either the understanding of religion is short of the facts or that the level of scientific achievement hasn't reached its climax (Altaie),

4. Grounds for Conflict between Science and Religion

The following were the most frequent grounds given for the conflict:

(i) When either one has overstepped its proper bounds (H. Smith, Gregersen , Polkinghorne and Guessoum). For example:

- Scientists have often extrapolated beyond the conclusions warranted by the empirical data (Jacob and Clayton), substituting philosophical theories for justified scientific inferences (Clayton).
- Some scientists have claimed that science's empirical-critical methodology is the only valid epistemology (Hurlbut). An approach to resolving such conflicts would be to emphasize that the naturalism of science is simply a methodological tool that does not at all address the nature of ultimate reality (Hurlbut).
- Scientists have adopted a reductionist view of science according to which science can explain everything (Bell, Butt and Trigg); in other words: erroneous deification of science (A. Grib).
- Religious people have claimed for religious territory what is not its to claim (Ellis).
- Scientists have failed to distinguish between scientific facts and scientistic beliefs (W. Smith).
- Scientists have been under the influence of the imperialistic behavior of rationalism in the realm of knowledge (Guiderdoni).
- A failure to understand scientific theory in its proper context.; a failure to understand what theory means in science; scientific fundamentalism ((Jackelén).

(ii) In so far as science and religion embody different ontological commitments as to the basic character of reality, conflicts are inescapable and should not be concealed (Gregersen).

(iii) Both science and religion routinely make metaphysical assumptions, but these can be in conflict (Albright).

(iv) Common areas of interest and different nature of approaches (Katasonov).

(v) Rival struggles for power (Poole , Hazim Shah); The conflict hypothesis was …not born out of a clash between science and religion, but out of an ideological campaign to establish scientists as the leading intellectual voice in society with established prestige as an independent professional community (Alexander).

(vi) Inconsistency between the data of science and the literal interpretation of the Holy books (Del Re , Jacob, Poole and Stenmark , Ward and Jackelén).

(vii) Secularistic or materialistic philosophies of science (Kamal Hassan).

(viii) Many people have not understood that science and religion have two different missions (Stenmark).

(ix) There has been a careful orchestrated campaign to persuade us that conflict is usual and inevitable. This dates from a determined effort in the 19th century by Huxley and his friends to make the "conflict thesis" part of popular cultural belief (C. A. Russell).

(x) There has been a tendency to a purely materialist interpretation of nature and a resistance to any sort of 'super natural' or spiritual causality (Ward).

(xi) A confusion between methodological reductionism and ontological reductionism (Jackelén).

(xii) Ignorance about cultural influences on both science and theology (Jackelén).

(xiii) Falsely equating science with modernity and modernity with secularism (Jackelén).

(xiv) Conflict between science and religion may arise as a result of misunderstanding of the religious people of the content of some of the religious texts. On the other hand, you find some prominent scientists believing that science and religion cannot be in harmony at all, because they have wrong conception of religion or God (Altaie).

5.The Role of Religion in the Development of Science

The majority of respondents expressed the view that religion had a positive role in the development of science in the Christian West. In their view, some of the religious ideas motivated scientific research. In other words, they provided the basic presuppositions needed for the development of science. The following are the most important points:

(i) The assumption of rational and orderly nature, thought by religion, implied that nature was amenable to scientific explanation (Giberson , Gregersen and Haught). Without belief in rationality, orderliness and intelligibility of nature science is impossible (Poole). It is certainly the case historically that the initial development of science took place largely at the hands of Jewish, Christian and Moslem believers (Polkinghorne).

(ii) Christian theology in and of itself inspired scientific inquiry. Where God is understood as the creator who has endowed the cosmos with order and humans with creative rationality, inquiry into how the cosmos works can indeed become a way of worship (Jackelén).

(iii) The discovery of the patterns of nature was a legitimate act of worship (Giberson), because it seemed that God could be glorified through a scientific study of nature (Poole and Butt). Scientists such as Newton and Boyle saw themselves as uncovering the laws of nature given by God as lawgiver and they saw the exercise of human reason as the exercise of a God-given faculty (Trigg).

(iv) There are good reasons for thinking that the Christian commitment and world-view of these early philosophers [e.g. during the period 1543-1680] did contribute very significantly to the emergence of modern science; particularly the notion of the 'laws of science ',which we now take so much for granted, ,is actually quite a recent concept, and was nurtured particularly out of the theistic convictions of Newton , Robert Boyle, and Rene Descartes (Alexander).

(v) Early Muslim thought enjoined the study of the natural world as a way of understanding God's creation. In Judaism and Christianity, similarly, the idea of one wise creator God inspired the search for rational principles or laws underlying observed reality. Many great scientists (e.g. Isaac Newton) were deeply religious and motivated by the desire to understand the divine wisdom evident in creation (Ward).

(vi) The world is open to the human mind, because God charged us to have dominion over it (Hodgson). The biblical concept of stewardship expresses our responsibility for the care of all things and this requires knowledge and commitment (Bube).

(vii) According to religious teachings, man was created in the "image of God", so he could understand nature, as his mind was image of God's mind (McIntyre).

(viii) The desacralization of the world by the three religions of the book facilitated the scientific approach to the world (Gregersen).

(ix) The world being contingent, one cannot expect to be able to deduce its nature from some supposed set of principles; Instead, one must look at the world to see that one God decided to create it (Stannard and Gregersen).

During the first millennium a similar theology of creation was influential in (the flowering of sciences) in the Islamic community (Giberson).

(x) Religion provided the initial institutional structure to the emergence of modern science through its organized monasteries and schools (Iqbal and Worthing).

Three other views were expressed concerning the rise of modern science:

- The birth of modern science which is essentially secularistic in nature was a liberation from the control of church dogmas and irrational beliefs (Kamal Hassan).
- The development of science in the West was less rooted in Christian theology than in the influence of printing and of religious strife (Albright).
- In the development of current Western science, there was no significant role of religion (Schütz). That the scientific revelation came so rapidly to dissociate itself from any debt to biblical theism argues that biblical theism may have served primarily a transitional role to displace inhibitory Greek views, rather than positively forming a conceptual base for modern science (Hurlbut).

6. Religious Science

Here, there was disagreement among the respondents. Some scholars denied that the concept makes any sense, but asserted that we can have a science compatible with religion (H. Smith), or a science open to religion and religious insights (Worthing). There were others who gave a meaning to the term, but disagreed with that meaning. For example:

- Introducing religious concepts into our description of scientific mechanism (Bube).
- Direct Divine intervention in the categories used in scientific descriptions (Bube).
- A science in which appropriate religious meaning is given to the scientific theories (Giberson).

Some scholars thought that the application of scientific knowledge and technology should be circumscribed by what revealed religions considers proper, useful and wholesome (J. al-Alwani and Kamal Hassan).

According to Hazim Shah, a possible meaning to the term 'religious science' is knowledge of the order of nature and the structure of reality as given through traditional religion and not through the 'scientific method', but such a science should not be subjected to the same epistemological criteria and standards which govern our knowledge of the manifest world .

However, there were some respondents who thought "religious science" makes sense and gave their interpretation of the term. The following definition summarizes the position of a good number of respondents (Bell, Davari, Davis, Fulljames, Giberson, Kamal Hassan, Poole, Reich and Trigg):

> *[This is a science] that includes the metaphysics which underlies the religious view of reality (Nasr).*

In fact, as M. Poole pointed out, Christian, Jewish and Islamic scientists saw science as a major activity operating within the wider perspective of a world which God has created and for which He holds us responsible.

For A. Grib, honest science is religious science. C. Townes believes that we can have religious science in the sense that science and religion must converge if we understand them well enough, and in that case, it may be difficult to distinguish sharply between them. Iqbal believes that science will become religious in time, because contemporary science is squarely faced with dilemma of its internal limitations.

According to Alexander, a religious believer's life is carried out within a theistic matrix, including all of science and all of humanities.

Here we mention several of the views expressed concerning the way religion affects science:

- According to Acikgenc, there are different traditions of science, because although as humans our epistemological faculties function in the same way, the way we utilize them under our cultural and psychological pressure is different.

- Gregersen believes that we neither should have or could have a religious science. What does exist, however, is science pursued in a predominantly religious (e.g. Islamic or Christian) context.
- In Clayton's view, science can be pursued with a religious mind-set, or with religious motivations, or by religious persons, as an act of obedience to the Divine.
- Kalin believes that it is a misnomer to speak of a "religious science". One can speak about the religious view of the universe and even a religious philosophy of science. It is, however, at the level of justification of scientific theories, rather than the level of discovery, that one can speak of a religious philosophy of science.
- According to Polkinghorne, scientifically stateable questions may be expected to receive scientifically stateable answers, and, in that sense, science does not require augmentation from religion.
- According to Altaie , religious sciences can flourish and offer the best service in the realm of morals and ethics, which is seriously needed for the utilization of scientific achievements in the life of the individual and the society.
- In Richardson's view, cultural and religious perspective has at last a background influence on the kinds of questions we ask, and stance we hold toward realities we investigate. Still, science is going to be most productive when its formal activity is not identified with any particular culture or religious influence.
- C. A. Russell believes that there are three ways in which religion may influence the progress of science:
  - Science can owe its inspiration to a particular religion.
  - Ethical insights derived from religion may define boundaries to scientific enquiry.
  - Religion imposes restrictions on the application of science in technology.
- According to Stenmark, religious values – and not merely secular and atheistic ones – are allowed to influence science, but when it comes to the justification of scientific theories, there should not be such interference.
- Several scholars thought that the application of scientific knowledge and technology should be circumscribed by what revealed religion

considers proper, useful and wholesome (Al-Alwani , Kamal Hassan and Jacob).

- One can distinguishes between the context of scientific theory and motivation for understanding scientific research. One may call the science of a pious practitioner "religious" if the practice was motivated by religious concerns (Brooke).
- According to Hewlett, we can envision a science that is carried out in collaboration with religious thought.
- Shami believes that if science is pursued such that it seeks the long-term well-being and happiness of mankind, then, it can be considered a religious science.

7.Negligence of religion by science

It seems rather obvious that scientists can do a good deal of scientific work irrespective of religious considerations. Contemporary scene is a good witness to this fact. But a large percentage of the respondents expressed the view that for one or more of the following reasons scientists cannot or should not dispense with religion:

- Science has a metaphysical basis (e.g. intelligibility and lawfulness of nature). Religion can provide science with precisely such a metaphysical basis (Albright, Bell, Hodgson, Katasonov and Trigg).
- Science cannot dispense with religion, as extra-scientific presuppositions are essential for choosing research projects, selecting theories and interpreting the results (Byl).
- Science is not self-interpreting. In order to understand its own results, it is inevitably constrained to draw on broader philosophical resources. Some of these metaphysical questions are religious questions: what preceded the Big Bang? etc. (Clayton).
- Science can dispense with religion, but scientists cannot – or at least not – without something in the room of religion to make their lives, and their careers in sciences, worthwhile. Scientists too must choose between good and evil (Rolston , Jackelén and Omar).
- There is no ultimate escape through sciences from human emotions, passions and needs (Brooke).
- Science can neglect religion, but scientists as human beings cannot, because human life encompasses much more than is adequately described

by science (Acikgenc, Bube, Guiderdoni , H. Smith and Stenmark).

- For some scientists, regular religion has been replaced by a different form of religion based on science (Davis and Wintermans).
- The negligence of religion by scientists has made the science a tool of the lust for power or a mere divertissement (Del Re).
- Passing science to its limits necessarily raises metaphysical or philosophical issues that science cannot answer (Ellis, Giberson, Kennedy, Koenig and Stoeger).
- Applied science necessarily involves value choices that are based on ethical viewpoints that cannot themselves be based on science (Ellis, Hubert, Kirmani, Kamal Hassan, Koenig, Plendl, Qurashi, Reich and Stannard).
- It is religion that gives meaning to our scientific activities (Acikgenc).
- The worldview generated by modern science has obviously failed to succeed even after three hundred years (Iqbal).
- Science can dispense with a particular religion, but it cannot claim to be operating within a framework of "no presuppositions" (Kalin).
- Science does not need to appeal to religion to find answers to its own restricted set of questions. The search for understanding will soon take the scientist outside the bounds of science – to the so-called "limit questions". Religion provides the most illuminating and intellectually satisfying responses to such questions (Polkinghorne).
- Modern science has dispensed with religion. The question is whether or not the world can survive if this trend continues (Bakar).
- Both sectors of knowledge in our modern age need each other for a successful and most efficient modern life (Altaie).
- At first sight science can dispense with religion, but at a deeper level, the concern to find truth and the belief that nature follows rational laws and is intelligible, depend upon a sort of religious belief in the rationality of a creative intelligence (Ward).

8. Separation of the domains of activity of science and religion

At first sight, it appears that one can separate the domains of activity of science and religion completely. The indifference of some successful scientists towards religious matters seems to support this view. One may say that these two are separate affairs because their subject matter and methodology is different, or that they try to answer different types of questions (e.g. science answers "how" questions and religion tries to answer "why" questions).

Careful inspection, however, does not confirm this inference. In fact, most of the respondents denied that this separation is really possible or advisable, though for different reasons. They gave illuminative reasons for denying this separation. Here, I mention a few of them:

- Religion supplies metaphysical assumptions underlying science (Albright, Bell, Byl, Hodgson, Katasonov, Poole and C. A. **Russell**). The ideal situation should be to have authentic metaphysical knowledge as the framework for both science and religion so that the two share common principles (Nasr). Science and religion share the quality of being human activities with a shared cultural field undergirded by some strong or more loose assumptions of basic reality (Gregersen).
- Choices of scientific problems will be influenced by scientist's theological convictions, and so are scientific descriptions (Bube and C. A. Russell).
- Separating the domains of science and religion results in intellectual anarchy and moral confusion (Butt).
- In the end, the study of science leads invariably back to religious questions (Clayton).
- The moral aspects of religion can affect decisions about the applications of science (Poole and C. A. Russell).
- The separation of science and religion leads to the shallowing of science, the overestimation of scientific power and the isolation of religion from the rest of culture (Katasonov).
- Religion is innate to man and to do science is his basic need (Kirmani).
- The parts of nature that science attempts to isolate and explain are parts of a greater truth that only religion can understand, describe and convey to humans (Koenig).
- With the development of science, our worldview develops, and it is necessary to restate the truth of all religions in a new language (Bell).
- Science provides the proper setting within which religious faith must be placed (Ellis).
- Science and religion should complement each other in providing us with a comprehensive view of reality (H. Smith, Fornæss and A. Grib). To accomplish this feat, it is essential that there be many scientific specialists who are well-informed in religious matters and substantial

number of religious leaders who are well-educated in contemporary science (Earley).

- Both domains are superimposed and they are separable only for analysis, but in practice we ought to have a holistic view of everything (Jacob).
- It is true that science and religion ask distinct types of questions about reality, nevertheless it is the same reality that is being addressed in both cases (Alexander).
- They should not be confused, but they cannot be completely separated, because man has to be one as God is One (Guiderdoni).
- Any understanding of science or of religion by humans must use whatever human resources we have, and in this use they cannot be separated completely (Townes).
- The domains of religion and science cannot easily be separated. If we mean by science a way of understanding the physical nature of the universe, and by religion not rituals but a worldview by which we look at the world, then there are more points of convergence than divergence between religion and science (Kalin).
- Methodologically, we can separate these activities quite considerably. Yet, if we want to understand the world as well as we can, if we ask for a meaningful and consistent world-view and if we take responsibility for the ways of the world, we cannot separate these two fascinating areas of knowledge (Jackelén) .
- If this is God's world, one would expect and hope for the convergence of scientific and religious insights as human knowledge progresses (Ward).
- The actual activity of science - designing new equipment, taking and analyzing measurements, framing and testing competing theories -all involve metaphysical and aesthetic assumptions that have deep roots in a religious attitude toward nature and which function in the construction of new scientific theories and the choice between them (R.J. Russell).
- In terms of methodology, the separation is desirable. Yet, the education of the aspiring scientists should be conceived so that they get a healthy dose of ethical education so as not to make out of them Faustian characters (Mimouni).
- In our search for both mechanism and meaning, science and religion are complementary approaches to the phenomenon of life (Hurlbut).

- As human activities, the two enterprises share a common ground, they are both grounded in a philosophical system that is, at some level, an attempt to understand the fundamental nature of reality (Hewlett).
- The two domains overlap in a number of areas (Bakar).
- Human activities, including scientific ones, cannot be divorced from ethical questions (Bakar).
- If religion is entitled to shape the direction and application of scientific research, then non-separation is not merely possible, but also a desirable state of affair (Stenmark).
- For theistic confessions of faith in a God who created the physical universe, any complete or absolute separation of science from religion would amount to a tacit denial of the most basic claims of theism (Worthing).
- Religion must hold the key for understanding why human reason – derived from God – can grasp the nature of a world created by Him (Trigg).
- Religion shapes our outlook and our paradigm, and it is impossible to be totally immune against religious influence when we approach the scientific research (Al-Alwani).
- Scientists with religious, or anti-religious, convictions have found it difficult in practice to completely insulate the dominant interests in their lives, one from the other (Brooke).
- "Limit questions" and the need for the moral wisdom link the two domains (Polkinghorne).
- There is no scientific guidance of life; despite the evident progress in the sciences in today's world, the value questions remain as acute and painful as ever (Rolston).

9. Conclusion

Even though the respondents were from different disciplines, different religious affiliations and different nationalities, there seems to be a lot of agreement between them as far as the responses to these questions are concerned, and even in those cases where the responses seem different, they are complementary, rather than conflicting. This shows that dialogue between scholars of different religious affiliations and different disciplines can be very illuminative and fruitful and can lead to a good understanding between the parties involved.

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